
Revised - Issued for Bid

U.S. Environmental Protection Agency
Fairmount City
St. Clair County, Illinois

Old American Zinc Plant Superfund Site
Facility Design

Specifications

June 2023



FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

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**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 GENERAL

1.01 SUBMITTALS

A. Action Submittals:

1. Operations Plan:
 - a. Submit an Operations Plan for approval that includes, but is not limited to:
 - 1) Description and list of operations that will be performed in connection with work to be performed at the site.
 - 2) Description of equipment and crew that will be used.
 - 3) Sequence of work.
 - 4) Means and methods for construction.
 - 5) Sources of imported materials.
 - 6) Stormwater Pollution Prevention Plan, which will include a soil erosion and sedimentation control plan.
 - 7) Excavation Plan, Detailing:
 - a) Utility Clearance.
 - b) Methods and sequencing of excavation.
 - c) Numbers, types, and sizes of equipment proposed to perform excavations.
 - d) Anticipated difficulties and proposed resolutions.
 - 8) Dewatering Plan.
 - 9) Restoration Plan if required by Section 02 24 00, Delineation of Wetlands and Other Waters of the United States.
 - 10) Performance Standard Verification Plan.
 - 11) Field Sampling Plan.
2. Health and Safety Plan.
3. Quality Control Plan.
4. Environmental Protection Plan.
5. Quality Assurance Project Plan (QAPP): The QAPP must be developed in accordance with EPA Requirements for Quality Assurance Project Plans, QA/R-5, EPA/240/B-01/003 (March 2001, reissued May 2006); Guidance for Quality Assurance Project Plans., QA/G-5, EPA/240/R 02/009 (December 2002); and Uniform Federal Policy for Quality Assurance Project Plans, Parts 1 3, EPA/505/B-04/900A through 900C (March 2005).
6. Waste/Hazardous Waste Management Plan.

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7. After completion of RA:
 - a. Surface Water Monitoring and Groundwater Monitoring Plan.
 - b. Updated Long Term Maintenance Plan.
 - c. Updated Institutional Controls and Implementation Plan.
 - d. Project Completion Report/Closure Report.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Facility Area Remedial Action:

1. Mobilization.
2. Surveying to document existing site conditions.
3. Performance of a wetland delineation in accordance with USACE protocols as described in Section 02 24 00, Delineation of Wetlands and other Waters of the United States.
4. Installation of new erosion/runoff control measures.
5. Clear and Grub site. Implement conservation measures for endangered species and migratory bird protocols per Section 31 10 00, Site Clearing if clearing and grubbing occurs between April 1 and September 30.
6. General clearing required to construct the site improvements as shown in the Drawings.
7. Installation of Contractor staging areas and coordination of staging area location(s) with other Contractors.
8. Implement the Unanticipated Discovery Plan (UDP) where indicated by Owner and as described in Section 31 23 16, Excavation.
9. Dewatering Plan.
10. Excavate slag from the Consolidation Area and clay stockpile areas as shown in the Drawings.
11. Excavate sediment from ditches as shown in the Drawings.
12. Excavate clay from the Consolidation Area.
 - a. Stockpile suitable clay for the Consolidation Area in the eastern portion of the site as shown in the Drawings.
 - b. Stockpile other excavated soil for general site fill in the northern portion of the site as shown in the Drawings.
13. Place stockpiled slag, excavated sediment from ditches, and excavated material from off-site residential properties consisting of soil potentially mixed with slag from northwestern portion of site into the Consolidation Area.
14. Excavate slag from the remainder of the Facility Area site and place into Consolidation Area.
15. Place 2-foot thick clay cover over Consolidation Area.
16. Fill site to design grades using stockpiled soil for general site fill.

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17. Place half-a-foot (6 inches) of topsoil over the site except on the Consolidation Area. Place one-foot (12 inches) of topsoil over the Consolidation Area.
18. Install seed, mulch, and erosion control for the entire site.
19. Restore wetland areas and other waters of the United States, if required based on input from EPA, USACE and other regulatory agencies based on the results of the wetlands and other waters delineation that Contractor performs per Section 02 24 00, Delineation of Wetlands and Other Waters of the United States.
20. Surveying to document remediated site conditions.
21. Demobilization.

1.03 WORK NOT COVERED BY CONTRACT DOCUMENTS

- A. Remedial work performed at adjacent residential properties.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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**SECTION 01 29 00
PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SUBMITTALS

- A. Informational Submittals:
 - 1. Schedule of Values: Submit on form approved by Owner's Representative .
 - 2. Schedule of Estimated Progress Payments:
 - a. Submit with initially acceptable Schedule of Values.
 - b. Submit adjustments thereto with Application for Payment.
 - 3. Application for Payment.
 - 4. Final Application for Payment.

1.02 CASH ALLOWANCES

- A. Consult with Engineer in selection of products or services. Obtain proposals from Suppliers and installers, and offer recommendations.
- B. Cash allowances will be administered in accordance with paragraph 13.02 of General Conditions.
- C. Submit, with application for payment, invoice showing date of purchase, from whom the purchase was made, the date of delivery of the product or service, and the price, including delivery to the Site and applicable taxes.

1.03 SCHEDULE OF VALUES

- A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.
- B. Upon request of Engineer, provide documentation to support the accuracy of the Schedule of Values.
- C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.
- D. Lump Sum Work:
 - 1. Reflect specified cash and contingency allowances and alternates, as applicable.

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2. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, equipment testing, facility startup, and contract closeout separately.
 - a. Mobilization includes, at minimum, items identified in Section 01 50 00, Temporary Facilities and Controls.
 - b. Include item(s) for monthly progress schedule update and maintenance of Engineer's trailer.
- E. An unbalanced or front-end loaded schedule will not be acceptable.
- F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.
- G. Submit Schedule of Values on a CD in a spreadsheet format compatible with latest version of MS Excel.

1.04 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

- A. Show estimated payment requests throughout Contract Times aggregating initial Contract Price.
- B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Contract Price as reflected by modifications to the Contract Documents.

1.05 APPLICATION FOR PAYMENT

- A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.
- B. Use detailed Application for Payment Form suitable to Engineer.
- C. Provide separate form for each schedule as applicable.
- D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.
- E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Engineer.

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F. Preparation:

1. Round values to nearest dollar.
2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Engineer.

1.06 MEASUREMENT—GENERAL

- A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and specifications as specified in National Institute of Standards and Technology, Handbook 44.
- B. Whenever pay quantities of material are determined by weight, weigh material on scales furnished by Contractor and certified accurate by state agency responsible. Obtain weight or load slip from weigher and deliver to Owner's representative at point of delivery of material.
- C. If material is shipped by rail, car weights will be accepted provided that actual weight of material only will be paid for and not minimum car weight used for assessing freight tariff, and provided further that car weights will not be acceptable for material to be passed through mixing plants.
- D. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by Engineer. Each vehicle shall bear a plainly legible identification mark.
- E. Haul materials that are specified for measurement by the cubic yard measured in the vehicle in transport vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Load vehicles to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.
- F. Quantities will be based on ground profiles shown. Field surveys will not be made to confirm accuracy of elevations shown.
- G. Where measurement of quantities depends on elevation of existing ground, elevations obtained during construction will be compared with those shown on Drawings. Variations of 1 foot or less will be ignored, and profiles shown on Drawings will be used for determining quantities.

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- H. Units of measure shown on Bid Form shall be as follows, unless specified otherwise.

Item	Method of Measurement
AC	Acre—Field Measure by Engineer
CY	Cubic Yard—Field Measure by Engineer within limits specified or shown
CY-VM	Cubic Yard—Measured in Vehicle by Volume
EA	Each—Field Count by Engineer
GAL	Gallon—Field Measure by Engineer
HR	Hour
LB	Pound(s)—Weight Measure by Scale
LF	Linear Foot—Field Measure by Engineer
SF	Square Foot
SY	Square Yard
TON	Ton—Weight Measure by Scale (2,000 pounds)

1.07 PAYMENT

- A. Payment for all Lump Sum Work shown or specified in Contract Documents is included in the Contract Price. Payment will be based on a percentage complete basis for each line item of the accepted Schedule of Values.
- B. Payment for unit price items covers all the labor, materials, and services necessary to furnish and install the following items.

1.08 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

- A. Payment will not be made for following:
1. Loading, hauling, and disposing of rejected material.
 2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
 3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
 4. Material not unloaded from transporting vehicle.
 5. Defective Work not accepted by Owner.
 6. Material remaining on hand after completion of Work.

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1.09 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

- A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings and preliminary operation and maintenance data is acceptable to Engineer.
- B. Final Payment: Will be made only for products incorporated in Work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.10 PARTIAL PAYMENT FOR UNDELIVERED, PROJECT-SPECIFIC MANUFACTURED OR FABRICATED EQUIPMENT

- A. Notwithstanding above provisions, partial payments for undelivered (not yet delivered to Site or not stored in the vicinity of Site) products specifically manufactured for this Project, excluding off the shelf or catalog items, will be made for products listed below when all following conditions exist:
 - 1. Partial payment request is supported by written acknowledgment from Suppliers that invoice requirements have been met.
 - 2. Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
 - 3. Each equipment item is clearly marked and segregated from other items to permit inventory and accountability.
 - 4. Authorization has been provided for access to storage Site for Engineer and Owner.
 - 5. Equipment meets applicable Specifications of these Contract Documents.
- B. Payment of 15 percent of manufacturer's quoted price for undelivered, Project-specific manufactured equipment will be made following Shop Drawing approval. Thereafter, monthly payments will be made based on progress of fabrication as determined by Engineer, but in no case will total of payments prior to delivery exceed 75 percent of manufacturer's quoted price.
- C. Failure of Contractor to continue compliance with above requirements shall give cause for Owner to withhold payments made for such equipment from future partial payments.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01 31 13
PROJECT COORDINATION**

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational:

1. Statement of Qualification (SOQ) for land surveyor or civil engineer.
2. Statement of Qualification (SOQ) for professional photographer and videographer.
3. Statement of Qualification (SOQ) for wetland delineation specialist.
4. Photographs:
 - a. Digital Images: Submit one copy of a DVD disc containing images within 5 days of being taken. Each image is to have a minimum file size of 1.4 Mb (1,400 Kb) so viewed resolution is high quality. The production of larger file sizes with higher resolution is encouraged.
5. Video Recordings: Submit one copy, including updated copy of project video log, within 5 days of being taken.

1.02 RELATED WORK AT SITE

A. General:

1. Other work that is either directly or indirectly related to scheduled performance of the Work under these Contract Documents, is anticipated to be performed at Site by others.
2. Coordinate the Work of these Contract Documents with work of others as specified in General Conditions.
3. Include sequencing constraints specified herein as a part of Progress Schedule.

1.03 UTILITY NOTIFICATION AND COORDINATION

- A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during the Work.**

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1.04 PROJECT MILESTONES

- A. General: Include the Milestones specified herein as a part of the Progress Schedule required under Section 01 32 00, Construction Progress Documentation.

1.05 FACILITY OPERATIONS

- A. Operations on site are no longer active.

1.06 ADJACENT FACILITIES AND PROPERTIES

- A. Examination:

1. After Effective Date of the construction contract and before Work at Site is started, Contractor, Engineer, and affected property owners and utility owners shall make a thorough examination of pre-existing conditions including existing buildings, structures, and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations.
2. Periodic reexamination shall be jointly performed to include, but not limited to, cracks in structures, settlement, leakage, and similar conditions.
3. Excavation will occur on the north side of Maryland Avenue which may result in the road becoming damaged. The contractor shall take precautions to minimize damage to roadway, and any damage incurred shall be repaired at no cost to the Owner or government.

- B. Documentation:

1. Record and submit documentation of observations made on examination inspections in accordance with Article Construction Photographs and Article Audio-Video Recordings.
2. Upon receipt, Engineer will review, sign, and return one record copy of documentation to Contractor to be kept on file in field office.
3. Such documentation shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Contractor's operations, and is for the protection of adjacent property owners, Contractor, and Owner.

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1.07 CONSTRUCTION PHOTOGRAPHS

A. General:

1. Photographically document all phases of the Project including preconstruction, construction progress, and post-construction.
2. Photography shall be by a professional commercial photographer, experienced in shooting exterior construction photos, in daylight and nighttime conditions, and in good and inclement weather.
3. Engineer shall have right to select subject matter and vantage point from which photographs are to be taken.
4. Digital Images: No post-session electronic editing of images is allowed. Stored image shall be actual image as captured without cropping or other edits.

B. Preconstruction and Post-Construction:

1. After Effective Date of the Agreement and before Work at Site is started, and again upon issuance of Substantial Completion, take a minimum of 48 photographs of Site and property adjacent to perimeter of Site.
2. Particular emphasis shall be directed to structures both inside and outside the Site.
3. Format: Digital, minimum resolution of 1832 by 3264 pixels and 24-bit, millions of color.

C. Construction Progress Photos:

1. Photographically demonstrate progress of construction, showing every aspect of Site and adjacent properties as well as interior and exterior of new or impacted structures.
2. Weekly: Take 48 photographs using digital, minimum resolution of 1832 by 3264 pixels and 24-bit, millions of color.
3. Monthly: Take 50 photographs using digital, minimum resolution of 1832 by 3264 pixels and 24-bit, millions of color.

D. Documentation:

1. Digital Images:
 - a. Electronic image shall have date taken embedded into image.
 - b. Archive using a commercially available photo management system that provides listing of photographs including date, keyword description, and direction of photograph.
 - c. Label each disk with Project and Owner's name, and month and year images were produced.

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1.08 AUDIO-VIDEO RECORDINGS

- A. Prior to beginning the Work on Site or of a particular area of the Work, and again within 10 days following date of Substantial Completion, video-graph Site and property adjacent to Site.
- B. In the case of preconstruction recording, no work shall begin in the area prior to Engineer's review and approval of content and quality of video for that area.
- C. Engineer shall have right to select subject matter and vantage point from which videos are to be taken.
- D. Video recording shall be by a professional commercial videographer, experienced in shooting exterior construction videos, in both good and inclement weather.
- E. Video Format and Quality:
 - 1. DVD format, with sound.
 - 2. Video:
 - a. Produce bright, sharp, and clear images with accurate colors, free of distortion and other forms of picture imperfections.
 - b. Electronically, and accurately display the month, day, year, and time of day of the recording.
 - 3. Audio:
 - a. Audio documentation shall be done clearly, precisely, and at a moderate pace.
 - b. Indicate date, project name, and a brief description of the location of recording, including:
 - 1) Facility name.
 - 2) Street names or easements.
 - 3) Addresses of private property.
 - 4) Direction of coverage, including engineering stationing, if applicable.
- F. Documentation:
 - 1. DVD Label:
 - a. DVD number (numbered sequentially, beginning with 001).
 - b. Project name.
 - c. Name of street(s) or easement(s) included.
 - d. Applicable location by engineering stationing.
 - e. Date and time of coverage.

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2. Project Video Log: Maintain an ongoing log that incorporates above noted label information for DVDs on Project.

1.09 REFERENCE POINTS AND SURVEYS

A. Contractor's Responsibilities:

1. Establish bench marks convenient to Work and at least every 500 feet on pipelines and roads.
2. Establish horizontal reference points or coordinate system with bench marks and reference points as necessary to lay out Work.
3. Provide additional survey and layout required to layout the Work.
4. Notify Engineer at least 3 working days in advance of time when grade and line to be provided by Owner will be needed.
5. In event of discrepancy in data or staking provided by Owner, request clarification before proceeding with Work.
6. Retain professional land surveyor or civil engineer registered in state of Illinois who shall perform or supervise engineering surveying necessary for additional construction staking and layout.
7. Maintain complete accurate log of survey work as it progresses as a Record Document.
8. On request of Engineer, submit documentation.
9. Provide competent employee(s), tools, stakes, and other equipment and materials as Engineer may require to:
 - a. Establish control points, lines, and easement boundaries.
 - b. Check layout, survey, and measurement work performed by others.
 - c. Measure quantities for payment purposes.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CUTTING, FITTING, AND PATCHING

- A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.
- B. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use recommended practice of manufacturer or appropriate trade association.

END OF SECTION

**SECTION 01 31 19
PROJECT MEETINGS**

PART 1 GENERAL

1.01 GENERAL

- A. Contractor shall schedule physical arrangements for meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

- A. Contractor shall be prepared to discuss the following subjects, as a minimum:

1. Required schedules.
2. Status of Bonds and insurance.
3. Sequencing of critical path work items.
4. Progress payment procedures.
5. Project changes and clarification procedures.
6. Use of Site, access, office and storage areas, security and temporary facilities.
7. Major product delivery and priorities.
8. Contractor's safety plan and representative.
9. Private utilities on site.

- B. Attendees will include:

1. Owner's representatives.
2. Contractor's office representative.
3. Contractor's resident superintendent.
4. Contractor's quality control representative.
5. Subcontractors' representatives whom Contractor may desire or Engineer may request to attend.
6. Engineer's representatives.
7. Others as appropriate.

1.03 PRELIMINARY SCHEDULES REVIEW MEETING

- A. As set forth in General Conditions and Section 01 32 00, Construction Progress Documentation.

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1.04 PROGRESS MEETINGS

- A. Engineer will schedule regular progress meetings at Site, conducted monthly to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, contract modifications, and other matters needing discussion and resolution.
- B. Attendees will include:
 - 1. Owner's representative(s), as appropriate.
 - 2. Contractor, Subcontractors, and Suppliers, as appropriate.
 - 3. Engineer's representative(s).
 - 4. Others as appropriate.

1.05 QUALITY CONTROL MEETINGS

- A. Scheduled by Engineer on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of the Work and work of other Contractors.
- B. Attendees will include:
 - 1. Contractor.
 - 2. Contractor's designated quality control representative.
 - 3. Subcontractors and Suppliers, as necessary.
 - 4. Engineer's representatives.

1.06 PREINSTALLATION MEETINGS

- A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.
- B. Require attendance of entities directly affecting, or affected by, the Work of that section.
- C. Notify Engineer 4 days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

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1.07 OTHER MEETINGS

- A. In accordance with Contract Documents and as may be required by Owner and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit at least 7 days prior to preconstruction conference.
2. Detailed Progress Schedule:
 - a. Submit initial Detailed Progress Schedule within 60 days after Effective Date of the Agreement.
 - b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
 - a. Contractor's certification that Progress Schedule submission is actual schedule being used for execution of the Work.
 - b. Electronic file compatible with latest version of Project Planner (P6) by Primavera Systems, Inc., unless otherwise approved by Engineer.
 - c. Progress Schedule: Four legible copies.
 - d. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
 - e. Progress Quantity Chart(s).
4. Prior to final payment, submit a final Updated Progress Schedule.

1.02 PRELIMINARY PROGRESS SCHEDULE

- A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 90 days, and a summary of balance of Project through Final Completion.**
- B. Show activities including, but not limited to the following:**
1. Notice to Proceed.
 2. Permits or substantive requirements compliance.
 3. Submittals, with review time. Contractor may use Schedule of Submittals specified in Section 01 33 00, Submittal Procedures.
 4. Early procurement activities for long lead equipment and materials.
 5. Initial Site work.
 6. Earthwork.
 7. Specified Work sequences and construction constraints.

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8. Contract Milestone and Completion Dates.
 9. Owner-furnished products delivery dates or ranges of dates.
 10. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
 11. System startup summary.
 12. Project close-out summary.
 13. Demobilization summary.
- C. Update Preliminary Progress Schedule monthly as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.
- D. Format: In accordance with Article Progress Schedule—Critical Path Network.

1.03 DETAILED PROGRESS SCHEDULE

- A. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.
- B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.
- C. When accepted by Engineer, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- D. Format: In accordance with Article Progress Schedule—Critical Path Network.
- E. Update monthly to reflect actual progress and occurrences to date, including weather delays.

1.04 PROGRESS SCHEDULE—CRITICAL PATH NETWORK

- A. General: Comprehensive computer-generated schedule using CPM, generally as outlined in Associated General Contractors of America (AGC) 580, “Construction Project Planning and Scheduling Guidelines.” If a conflict occurs between the AGC publication and this specification, this specification shall govern.

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B. Contents:

1. Schedule shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. Identify Work calendar basis using days as a unit of measure.
3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.
4. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path of activities.
5. Reflect sequences of the Work, restraints, delivery windows, review times, Contract Times and Project Milestones set forth in the Agreement and Section 01 31 13, Project Coordination.
6. Include as applicable, at a minimum:
 - a. Obtaining permits, or permit-equivalent approvals where required, submittals for early product procurement, and long lead time items.
 - b. Mobilization and other preliminary activities.
 - c. Initial Site work.
 - d. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
 - e. Sitework.
 - f. Project closeout and cleanup.
 - g. Demobilization.
7. No activity duration, exclusive of those for Submittals review and product fabrication/delivery, shall be less than 1 day nor more than 14 days, unless otherwise approved.
8. Activity duration for Submittal review shall not be less than review time specified unless clearly identified and prior written acceptance has been obtained from Engineer.

C. Network Graphical Display:

1. Plot or print on paper not greater than 30 inches by 42 inches or smaller than 22 inches by 34 inches, unless otherwise approved.
2. Title Block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
3. Identify horizontally across top of schedule the time frame by year, month, and day.
4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
5. Indicate the critical path.
6. Show, at a minimum, the controlling relationships between activities.

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7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.
8. Plot activities on an early start basis unless otherwise requested by Engineer.
9. Provide a legend to describe standard and special symbols used.

D. Schedule Report:

1. On 8-1/2-inch by 11-inch white paper, unless otherwise approved.
2. List information for each activity in tabular format, including at a minimum:
 - a. Activity Identification Number.
 - b. Activity Description.
 - c. Original Duration.
 - d. Remaining Duration.
 - e. Early Start Date (Actual start on Updated Progress Schedules).
 - f. Early Finish Date (Actual finish on Updated Progress Schedules).
 - g. Late Start Date.
 - h. Late Finish Date.
 - i. Total Float.
3. Sort reports, in ascending order: Activity number sequence with predecessor and successor activity.

1.05 PROGRESS OF THE WORK

A. Updated Progress Schedule shall reflect:

1. Progress of Work to within 5 working days prior to submission.
2. Approved changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.
6. Revised projections of progress and completion.
7. Report of changed logic.

B. Produce detailed sub-schedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as facility shutdowns.

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- C. If an activity is not completed by its latest scheduled completion date and this failure is anticipated to extend Contract Times (or Milestones), submit, within 7 days of such failure, a written statement as to how nonperformance will be corrected to return Project to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.
- D. Owner may order Contractor to increase plant, equipment, labor force, or working hours if Contractor fails to:
 - 1. Complete a Milestone activity by its completion date.
 - 2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

1.06 NARRATIVE PROGRESS REPORT

- A. Format:
 - 1. Organize same as Progress Schedule.
 - 2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.
- B. Contents:
 - 1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
 - 2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
 - 3. Contractor's plan for management of Site (for example, lay down and staging areas, construction traffic), use of construction equipment, buildup of trade labor, and identification of potential Contract changes.
 - 4. Identification of new activities and sequences as a result of executed Contract changes.
 - 5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
 - 6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
 - 7. Changes to activity logic.
 - 8. Changes to the critical path.
 - 9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
 - 10. Steps taken to recover the schedule from Contractor-caused delays.

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1.07 SCHEDULE ACCEPTANCE

- A. Engineer's acceptance will demonstrate agreement that:
1. Proposed schedule is accepted with respect to:
 - a. Contract Times, including Final Completion and all intermediate Milestones, are within the specified times.
 - b. Specified Work sequences and constraints are shown as specified.
 - c. Access restrictions are accurately reflected.
 - d. Startup and testing times are as specified.
 - e. Submittal review times are as specified.
 - f. Startup testing duration is as specified and timing is acceptable.
 2. In all other respects, Engineer's acceptance of Contractor's schedule indicates that, in Engineer's judgment, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Engineer's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to Engineer's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.
- B. Unacceptable Preliminary Progress Schedule:
1. Make requested corrections; resubmit within 10 days.
 2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process, including updating schedule on a monthly basis to reflect actual progress and occurrences to date.
- C. Unacceptable Detailed Progress Schedule:
1. Make requested corrections; resubmit within 10 days.
 2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process.
- D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Engineer's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

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1.08 **ADJUSTMENT OF CONTRACT TIMES**

- A. Reference General Conditions.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.
- C. Schedule Contingency:
 - 1. Contingency, when used in the context of the Progress Schedule, is time between Contractor's proposed Completion Time and Contract Completion Time.
 - 2. Contingency included in Progress Schedule is a Project resource available to both Contractor and Owner to meet Contract Milestones and Contract Times. Use of Schedule contingency shall be shared to the proportionate benefit of both parties.
 - 3. Use of schedule contingency suppression techniques such as preferential sequencing and extended activity times is prohibited.
 - 4. Pursuant to Contingency sharing provisions of this specification, no time extensions will be granted, nor will delay damages be paid until a delay occurs which (i) consumes all available contingency time, and (ii) extends Work beyond the Contract Completion date.
- D. Claims Based on Contract Times:
 - 1. Where Engineer has not yet rendered formal decision on Contractor's Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, reflect an interim adjustment in the Progress Schedule as acceptable to Engineer.
 - 2. It is understood and agreed that such interim acceptance will not be binding on either Contractor or Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
 - 3. Revise Progress Schedule prepared thereafter in accordance with Engineer's formal decision.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of Nurserymen (AAN): American Standards for Nursery Stock.
2. Federal Emergency Management Agency (FEMA).
3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.
5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
6. OSHA 29 CFR 1910 and 1926.
7. U.S. Environmental Protection Agency (EPA):
 - a. Oil Pollution Prevention, 40 CFR, Part 112.
 - b. National Pollutant Discharge Elimination System (NPDES) (40 Code of Federal Regulations Part 122.26(a)(14)(x))
8. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.
9. Illinois Environmental Protection Agency:
 - a. Illinois Administrative Code (IAC) Title 35, Sections 302.208 and 302.210.
 - b. Illinois General NPDES Permit No. ILR10 for Storm Water Discharges from Construction Site Activities (IEPA 2013), IAC Title 35, Subtitle C, Chapter 1, Part 302, the and the guidance provided in the Illinois Urban Manual (www.aiswcd.org/IU).
 - c. Air Pollution Control Rules, IAC Title 35, Subtitle B, Chapter 1, Part 212 Visible and Particulate Matter Emissions, Subpart K.
 - d. IAC Title 35, Part 212.301, 212.315, and 212.316 of Subpart K Fugitive Particulate Matter.
 - e. IAC Title 35, Subtitle H Part 900.102-106 Noise.

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1.02 SUBMITTALS

A. Informational Submittals:

1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
2. Temporary Utility Submittals:
 - a. Electric power supply and distribution plans.
 - b. Water supply and distribution plans.
 - c. Dewatering well locations.
 - d. Dewatering Plan including water treatment system details.
 - e. Sanitary.
3. Temporary Construction Submittals:
 - a. Access Roads: Routes, cross-sections, and drainage facilities.
 - b. Parking area plans.
 - c. Contractor's field office, storage yard, and storage building plans, including gravel surfaced area.
 - d. Fencing and protective barrier locations and details.
 - e. Engineer's field office plans.
 - f. Staging area location plan.
4. Temporary Control Submittals:
 - a. Noise control plan.
 - b. Dust control plan.
 - c. Stormwater Pollution Prevention Plan.
 - d. Plan for disposal of waste materials and intended haul routes.

B. Action Submittals: Restoration Plan if required by Section 02 24 00, Delineation of Wetland and Other Waters of the United States.

1.03 MOBILIZATION

A. Mobilization includes, but is not limited to, these principal items:

1. Obtaining required permits.
2. Moving Contractor's field office and equipment required for first month operations onto Site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite Internet service.
5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
6. Arranging for and erection of Contractor's work and storage yard.

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7. Posting OSHA required notices and establishing safety programs and procedures.
 8. Having Contractor's superintendent at Site full time.
 9. Providing Engineer's facilities.
- B. Use area designated for Contractor's temporary facilities as shown on Drawings.
1. Area designated for temporary facilities shown on Drawings shall be tested to confirm that it is clean of any contamination before mobilization.
 2. If contamination exists, Contractor shall excavate and clean the area before building out temporary facilities.
- C. Progress payment for mobilization will not be approved.

1.04 PROTECTION OF WORK AND PROPERTY

- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of serious onsite accidents and related claims.
- C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

1.05 VEHICULAR TRAFFIC

- A. Traffic Control Plan: Adhere to traffic control plan reviewed and accepted by Engineer. Changes to this plan shall be made only by written approval of Engineer. Secure approvals for necessary changes so as not to delay progress of the Work.
- B. Traffic Routing Plan: Show sequences of construction affecting use of roadways, time required for each phase of the Work, provisions for decking over excavations and phasing of operations to provide necessary access, and plans for signing, barricading, and striping to provide passages for pedestrians and vehicles.

1.06 TEMPORARY CONTROLS

- A. Contractor will provide safety and environmental controls during remediation-related construction activities to protect the public, workers, and environment and ensure that all work is performed in a manner that meets the intent of federal, state, and local environmental regulations.

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- B. Stormwater Pollution Prevention Plan: Contractor will submit a Stormwater Pollution Prevention Plan for approval by the Owner's Representative. The Stormwater Pollution Prevention Plan will be consistent with substantive requirements of Illinois's General NPDES Permit No. ILR10 for Storm Water Discharges from Construction Site Activities (IEPA 2013), Illinois Administrative Code Title 35, Subtitle C, Chapter 1, Part 302, the National Pollutant Discharge Elimination System (NPDES) requirements (40 Code of Federal Regulations Part 122.26(a)(14)(x).) and the guidance provided in the Illinois Urban Manual (www.aiswcd.org/IU). The plan will:
1. Describe the best management practices for earth disturbing activities and procedures to control soil erosion, sediment transport, and potential spills, including from stockpiles of general backfill, topsoil, and excavated soils, excavations, and at the construction site entrance and exit.
 2. Describe erosion and sediment control at staging, stockpiling, and storage areas, including silt fence or other appropriate measures and inlet protection.
 3. Describe how water entering excavations and contained on top of liners will be discharged as clean stormwater and other stormwater management activities.
 4. Address preplanning for spill control and spill control measures, including potential spills of decontamination rinsate, contaminated soils, vehicle fuel, and hydraulic oil.
 5. Address fire control materials and equipment.
 6. Address protection against stockpile runoff.
 7. Describe inspection and maintenance procedures.
- C. Contractor will install, inspect, maintain and provide recordkeeping for temporary stormwater pollution prevention and soil erosion and sediment control measures under the authorization of an Illinois qualified person (i.e., Professional Engineer, Certified Professional in Erosion and Sediment Control, Certified Erosion Sediment and Storm Water Inspector, or other knowledgeable person) who possesses the skills to assess conditions at construction site that could impact stormwater quality and assess effectiveness of any sediment and erosion control measures implemented. The Contractor will ensure that temporary stormwater pollution prevention and soil erosion and sediment control measures prevent erosion during earthwork activities at residential properties. The work will include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified.
1. Erosion control will be performed in accordance with the Stormwater Pollution Prevention Plan and the Temporary Erosion and Sediment Control Plan.

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2. Soil erosion stabilization and sedimentation control may consist of construction, inspection, maintenance and recordkeeping of temporary erosion control such as inlet protection, silt fences, erosion bales, etc. Inlet protection will be installed at the nearest downgradient storm sewer inlet.
- D. Contractor will install, inspect, maintain, and remove temporary stormwater pollution prevention and erosion and sediment control measures to prevent erosion at the FA.
 1. Soil erosion stabilization and sedimentation control will consist of the following elements:
 - a. Construction, inspection, maintenance, and record keeping of temporary erosion and sediment control such as silt fences, erosion bales, etc. where runoff will occur onto unpaved surfaces.
 - b. Excavated soils will be staged and managed with appropriate protection. The staging pile will be located on the FA, as shown on the Drawings, no greater than 10 feet high, sloped no greater than 4H:1V, and will be covered daily with plastic sheeting, or approved equivalent.
 - c. Stockpiles will not be placed over existing monitoring wells located at the FA, nor will they prohibit access to existing monitoring wells.
 - d. Temporary stockpile covering: Placement and maintenance of reinforced plastic covering over stockpiles during non-working hours or inclement weather to reduce fugitive dust emissions from staging piles and protect from precipitation and erosion.
 - e. As necessary, place stone at the FA staging area between the stockpiles and the entrance to minimize tracking of soils from the staging area.
 - f. Documentation of final restoration of staging pile at the FA.
- E. The Contractor will restore wetlands and other waters of the United States, if required based on input from EPA, USACE, and other regulatory agencies based on the results of the wetlands and other waters delineation that Contractor performs per Section 02 24 00, Delineation of Wetlands and Other Waters of the United States.

PART 2 PRODUCTS

2.01 ENGINEER'S FIELD OFFICES

- A. Furnish equipment specified for exclusive use of Engineer and its' representatives.
- B. Ownership of equipment furnished under this article will remain, unless otherwise specified, that of Contractor.

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- C. Equipment furnished shall be new or like new in appearance and function.
- D. Minimum Features:
 - 1. 110-volt lighting and wall plugs for every 8 feet of wall.
 - 2. Fluorescent ceiling lights.
 - 3. Electric heating and self-contained air conditioning unit, properly sized for Project locale and conditions. Provide ample electric power to operate installed systems.
 - 4. Provide railed stairways, and landings, and exterior lighting at entrances.
 - 5. Exterior Door(s):
 - a. Number: Two.
 - b. Type: Solid core.
 - c. Lock(s): Cylindrical.
 - 6. Number of Windows: Four.
 - 7. Minimum Interior Height: 8 feet.
- E. Rooms: Two, with minimum private office floor space of 80 square feet, and remainder configured for open meeting or storage space.
- F. Trailer Type Mobile Structure: One.
- G. Floor Space: Minimum 425 square feet.
- H. All-metal frame; all-metal exterior, sides, and roof; and insulated double walls, floor, and roof.
- I. Security guard screens on windows.
- J. Blinds or drapes on windows.
- K. Storage Room: One, 6 feet by 8 feet, with door and cylinder lock, keyed differently than exterior door locks. Provide two sets of keys.
- L. Office Equipment—General:
 - 1. Bottled Water Service: One, with cooler capable of producing hot water and cold water.
 - 2. Paper Towel Dispenser with Towels: One.
 - 3. Desk: Four, steel, 30 inches by 60 inches with desk surface located 29 inches from floor.
 - 4. Desk Chair: Four, with the following characteristics:
 - a. Five castor base.
 - b. Adjustable height.

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- c. Swivels.
- d. Locking Back.
- e. Adjustable seat back for height and angle.
- f. Adjustable arms.
- 5. Folding Table: One, 36 inches by 72 inches.
- 6. Conference Room Chairs: Six.
- 7. Drawing Rack with Drawing Hangers: One.
- 8. Four-Drawer Steel File with Lock: One, legal width.
- 9. Microwave oven, refrigerator and food prep area with upper cabinet.
- 10. Wastepaper Basket: Two.
- 11. Blue Recycling Basket: Two.
- 12. Clothes Rack: One.
- 13. First-Aid Kit: One.
- 14. Tri-Class (ABC), Dry Chemical Fire Extinguisher, 10-Pound: One.

2.02 PROJECT SIGN

- A. Provide and maintain one, 8-foot-wide by 4-foot-high sign constructed of 3/4-inch exterior high density overlaid plywood. Sign shall bear name of Project, Owner, Contractor, Engineer, and other participating agencies. Lettering shall be blue applied on white background by an experienced sign painter. Include Owner's and agency's logos full color. Provide exterior type enamel paint. Information to be included and logo graphic will be provided by Owner.

PART 3 EXECUTION

3.01 ENGINEER'S FIELD OFFICE

- A. Make available for Engineer's use prior to start of the Work at Site and to remain on Site for minimum of 30 days after final acceptance of the Work.
- B. Locate where directed by Engineer; level, block, tie down, skirt, provide stairways, and relocate when necessary and approved. Construct on proper foundations, and provide proper surface drainage and connections for utility services.
- C. Provide minimum 100 square feet of gravel or crushed rock base, minimum depth of 4 inches, at each entrance.
- D. Raise grade under field office, as necessary, to elevation adequate to avoid flooding.
- E. Provide sanitary facilities in compliance with state and local health authorities.

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- F. Exterior Door Keys: Furnish two sets of keys.
- G. Local Area Network (LAN):
 - 1. Provide Hi-speed internet with unlimited data restrictions.
 - 2. Provide Ethernet network prewired in compliance with EIA/TIA 568B.
 - 3. Ethernet wireless hub shall be capable of a minimum of four connections.
 - 4. LAN shall be designed and installed by personnel experienced in similar LAN systems.
- H. Telecommunications:
 - 1. Provide cable Internet connection with minimum of five live portable computer (PC) ports.
 - 2. Provide appropriate jacks, wiring, and equipment required for a complete telecommunications system.
 - 3. Arrange and provide for telecommunication service for use during construction. Pay costs of installation, maintenance, and monthly service of internet connection.
- I. Maintain in good repair and appearance, and provide weekly cleaning service and replenishment, as required, of paper towels, paper cups, hand soap, toilet paper, first-aid kit supplies, and bottled water.
- J. Copier, capable of producing both black and white, and color images, multi-function with scanning, email, and fax capabilities, self-feeding, capable of providing 11-inch by 17-inch, 8-1/2-inch by 11-inch, and 8-1/2-inch by 14 inch copies and collating multiple copies to 10, and reduction and enlargement capabilities; include maintenance service agreement for duration of contract.
- K. Replenish, as needed, copy paper and toner.

3.02 TEMPORARY UTILITIES

- A. Power:
 - 1. No electric power is available at Site. Make arrangements to obtain and pay for electrical power used until final payment and acceptance by Owner, unless otherwise recommended by Engineer at Substantial Completion.
 - 2. Cost of electric power will be borne by Contractor.

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- B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.
- C. Heating, Cooling, and Ventilating:
1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage because of temperature or humidity.
 2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
 3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.
 4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
 5. If permanent natural gas piping is used for temporary heating units, do not modify or reroute gas piping without approval of utility company. Provide separate gas metering as required by utility.
- D. Water:
1. No construction or potable water is available at Site. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.
 2. Hydrant Water:
 - a. Is available from nearby hydrants. Secure written permission for connection and use from water department and meet requirements for use. Notify fire department before obtaining water from fire hydrants.
 - b. Use only special hydrant-operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify appropriate agency as quickly as possible. Hydrants shall be completely accessible to fire department at all times.
 - c. Include costs to connect and transport water to construction areas in Contract Price.
- E. Sanitary and Personnel Facilities: Provide and maintain facilities for Contractor's employees, Subcontractors, and other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

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- F. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

3.03 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours, unless special arrangements have been made.
3. Maintain in continuous service existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and other utilities encountered a long line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
4. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with owner of said utility and perform work to their satisfaction.
5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
7. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
8. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance: Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain original Site drainage wherever possible.

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B. Signs and Equipment:

1. Conform to requirements of manual published by the Illinois Department of Transportation.
2. Portable TOW-AWAY-NO STOPPING Signs: Place where approved by police department and Owner.
3. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movements.
4. High-Level Warning Flag Units: Provide two in advance of traffic approaching the Work, each displaying three flags mounted at a height of 9 feet.
5. Provide at obstructions, such as material piles and equipment.
6. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

C. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

D. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water. Allow pumped water to percolate into the ground where possible. Pumped water that discharges to a ditch, creek, or surface water must meet the water quality standards in 35 IAC Section 302.208 and 302.210. Submit a Dewatering Plan per Section 01 57 13, Pollution Prevention and Temporary Erosion and Sediment Control. including plans for a treatment system and associated monitoring, if necessary to meet these standards.

E. Archaeological Finds:

1. General: Should finds of an archaeological or paleontological nature be made within Site limits, immediately notify Owner and Engineer and proceed in accordance with General Conditions. Continue the Work in other areas without interruption.
2. Archaeological Finds: Evidence of human occupation or use of an area within contract limits prior to the Year 1840. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.

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3. Paleontological Finds: Evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications such as pictographs.
4. Owner may order the Work stopped in other areas if, in Owner's opinion, find is more extensive than may appear from uncovered material.
5. Protection of Finds:
 - a. Implement protocols in the Unanticipated Discovery Plan (UDP) described in Section 31 23 16, Excavation. Cover, fence, or otherwise protect finds until notice to resume the Work is given.
 - b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over plastic film.
 - c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
 - d. Dewater finds made below water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
6. Removal of Finds:
 - a. Finds are property of Owner. Do not remove or disturb finds without Owner's written authorization.
 - b. Should Owner elect to have a find removed, provide equipment, labor, and material to permit safe removal of find without damage. Provide transportation for delivery to individuals, institutions, or other places as Owner may find desirable, expedient, or required by law.

F. Endangered and Threatened Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Implement protocols in Section 31 10 00, Site Clearing.
3. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
4. Contractor will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
5. Additional areas will be marked by Contractor as other habitats of endangered and threatened species become known during construction.

3.04 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.

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2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
 3. Conduct operations of excavation and hauling in trucks to cause a minimum of dust. Give unpaved haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
- B. Noise Control:
1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
 2. Noise Control Plan: Propose plan to mitigate construction noise and to comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.
- C. Water Pollution Control:
1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to existing waterway.
 2. Prior to commencing excavation and construction, obtain Engineer's agreement with detailed Dewatering Plan showing procedures intended to handle and dispose of sewage, groundwater, and dewatering pump discharges. Pumped water discharges from excavations or dewatering wells that does not percolate back into the ground must comply with water quality standards in 35 Illinois Administrative Code Sections 302.208 and 302.210.
 3. Comply with Section 01 57 13, Pollution Prevention and Temporary Erosion and Sedimentation Control, for stormwater flow and surface runoff.
 4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.
- D. Erosion, Sediment, Water Quality, and Flood Control: Provide, maintain, and operate temporary facilities as specified in Section 01 57 13, Pollution Prevention and Temporary Erosion and Sedimentation Control, to control erosion and sediment releases, protect surface water quality and to protect the Work and existing facilities from flooding during construction period.

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3.05 STORAGE YARDS AND BUILDINGS

- A. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.
- B. Temporary Storage Buildings:
 - 1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
 - 2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
 - 3. Store combustible materials (paints, solvents, fuels) in a well-ventilated and remote building meeting safety standards.

3.06 ACCESS ROADS

- A. Construct access roads as shown and within easements, rights-of-way, or Project limits. Use existing roads where shown.
- B. Maintain drainage ways. Install and maintain culverts to allow water to flow beneath access roads. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.
- C. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.
- D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.
- E. Coordinate with Engineer detours and other operations affecting traffic and access. Provide at least 72 hours' notice to Engineer of operations that will alter access to Site.
- F. Upon completion of construction, restore ground surface disturbed by access road construction to original grade.

3.07 PARKING AREAS

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. Provide parking facilities for personnel working on Project. No employee or equipment parking will be permitted on Owner's existing paved areas, except as specifically designated for Contractor's use.

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3.08 VEHICULAR TRAFFIC

- A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.
- B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
- D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.
- E. Maintenance of traffic is not required if Contractor obtains written permission from Owner and tenant of private property, or from authority having jurisdiction over public property involved, to obstruct traffic at designated point.
- F. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.
- G. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
- H. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
- I. Provide snow removal to facilitate normal vehicular traffic on public or private roads affected by construction. Perform snow removal promptly and efficiently by means of suitable equipment whenever necessary for safety, and as may be directed by proper authority.

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- J. Notify fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Contractor's night emergency telephone numbers to police department.
- K. Coordinate traffic routing with that of others working in same or adjacent areas.

3.09 CLEANING DURING CONSTRUCTION

- A. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.
- B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up and dispose of debris.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least weekly, dispose of such waste materials, debris, and rubbish offsite.
- D. At least weekly, brush sweep entry drive, roadways, and other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

SECTION 01 57 13
POLLUTION PREVENTION AND TEMPORARY EROSION
AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers Work to implement structural and nonstructural Best Management Practices (BMP) to control soil erosion by wind or water and keep eroded sediments and other construction-generated pollutants from moving off project sites. Requirements described in this specification and shown on the Drawings are part of the project Stormwater Pollution Prevention Plan (SWPPP) and are the minimum for all project construction sites and conditions. This specification covers all project activities, including material sources, disposal sites, and offsite mitigation areas unless specific project activities are excluded elsewhere in this specification or in other Contract Documents controlling the Work.
- B. National Pollutant Discharge Elimination System: Comply with Federal, state, and local laws, rules and regulations, and the Illinois National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge ILR10 General Permit substantive requirements, which are applicable to the project. A copy of the ILR10 General Permit, is available from Owner. NPDES General Construction permits are required on projects that involve disturbance of 1 acre or more with potential to discharge stormwater to surface waters.
- C. Other Regulations: Local government erosion and sediment control permit best management practices and standards may apply. Adequate erosion and sediment control is essential for complying with the federal Endangered Species Act where construction runoff enters waters inhabited by protected species.

1.02 REFERENCES

- A. Activities shall conform to the Illinois General NPDES Permit No. ILR10 for Storm Water Discharges from Construction Site Activities (IEPA 2013), IAC Title 35, Subtitle C, Chapter 1, Part 302, the guidance provided in the Illinois Urban Manual (www.aiswcd.org/IU) and the Illinois Erosion and Sediment Control Manual Standard Specifications, and Drawings. In the event of a conflict, the more stringent requirement shall apply.

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B. The following is a list of standards that may be referenced in this section:

1. Illinois Environmental Protection Agency (IEPA) General NPDES Permit No. ILR10 for Stormwater Discharges from Construction Activities.
2. American Association of State Highway and Transportation Officials (AASHTO): M252, Standard Specification for Corrugated Polyethylene Drainage Pipe.
3. ASTM International (ASTM):
 - a. D638, Standard Test Method for Tensile Properties of Plastics.
 - b. D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
 - c. D3776/D3776M, Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.
 - d. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - e. D4397, Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
 - f. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - g. D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - h. D4632/D4632M, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - i. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - j. D6241, Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
 - k. D6459, Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion.
 - l. D6460, Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion.
 - m. D6475, Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets.
 - n. D7322, Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Ability to Encourage Seed Germination and Plant Growth Under Bench-Scale Conditions.
 - o. D7367, Standard Test Method for Determining Water Holding Capacity of Fiber Mulches for Hydraulic Planting.

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4. National Weather Service:
 - a. Precipitation-Frequency of the United States by State/Territory, 2012.
 - b. Precipitation Frequency Data Server, 2012.
5. North American Weed Management Association (NAWMA).
6. U.S. Department of Agriculture, Natural Resources Conservation Service: *Urban Hydrology for Small Watersheds*; 1986. Technical Release 55.
7. U.S. Environmental Protection Agency:
 - a. Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, 2007. EPA-833-R-06-004.
 - b. National Menu of BMPs, 2012.

1.03 SYSTEM DESCRIPTION

A. Erosion and Sediment Control:

1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases during construction period.
2. Design erosion and sediment controls to handle peak runoff resulting from 25-year, 24-hour storm event based on National Weather Service: Precipitation Frequency Data Server.
3. Size temporary stormwater conveyances based on procedures presented in U.S. Department of Agriculture, Natural Resources Conservation Service: *Urban Hydrology for Small Watersheds*, 1986. Technical Release 55.

B. Erosion and Sediment Control (ESC) Lead:

1. Identify the ESC Lead at the preconstruction discussions and in the TESC Plan. The ESC Lead shall have certification in construction site erosion and sediment control from a course approved by Owner.
2. The ESC Lead shall implement the TESC Plan, including, but not limited to:
 - a. Installing and maintaining all temporary erosion and sediment control Best Management Practices (BMPs) included in the TESC Plan to assure continued performance of their intended function. Damaged or inadequate TESC BMPs shall be corrected immediately.
 - b. Updating TESC Plan to reflect current field conditions.
 - c. Terminating TESC Plan.

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3. When a TESC Plan is included in the Contract Plans, ESC Lead shall also inspect all areas disturbed by construction activities, all onsite erosion and sediment control BMPs, all stormwater discharge points, and all temporarily stabilized inactive sites per schedule in the Construction Stormwater Discharge Permit(s) or as directed by Engineer. Complete erosion and sediment control inspection form provided by water resource agency or Owner for each inspection and submit a copy to Engineer no later than end of the next working day following inspection.
- C. Personnel Training: Prior to commencement of construction, applicable personnel must have an understanding of the Construction Stormwater Discharge Permit's requirements and their specific responsibilities under the permit. At a minimum, personnel must be trained to understand the following as it relates to the scope of their job duties:
1. The location of all stormwater controls and how to maintain them.
 2. Procedures for complying with the pollution prevention requirements.
 3. Procedures for conducting inspections, recording findings, and taking corrective action.
- D. Temporary Erosion and Sediment Control Plan (a component of the Stormwater Pollution Prevention Plan):
1. Contractor shall prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) in accordance with Section 01 50 00, Temporary Facilities and Controls. A Temporary Soil Erosion and Sediment Control Plan is a component of the SWPPP.
 2. A TESC Plan is furnished as part of the Drawings, which helps fulfill part of the plan requirement of the NPDES Permit. This initial TESC Plan, when adopted by Contractor, may be used as the basis of the construction TESC Plan. Additional or revised erosion and sediment control features, not shown on the initial TESC Plan, may be required depending on Contractor's methods of operation and schedule.
 3. For each phase of the scheduled work, indicate on the TESC Plan all the BMPs proposed and installed for erosion and sediment control to minimize clearing, stabilize exposed soil, divert or temporarily store flows, limit runoff from exposed areas, and filter transported sediment. Include all temporary slopes, constructed for staging or other reasons, which may not have been identified in the original Contract plans. Refer to the current local jurisdiction's erosion and sediment control manual.

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4. Some TESC Plan required elements typically required by NPDES permits:
- a. Narrative Site Description:
 - 1) Nature of construction activity planned for the Site.
 - 2) Estimates of total site area and the areas of the Site expected to be disturbed.
 - 3) Soil types found onsite and their erosion potential.
 - 4) The types of fill materials to be used.
 - 5) Timetable for sequence of major construction events.
 - b. Site Map:
 - 1) All areas of development.
 - 2) Drainage patterns.
 - 3) Areas of soil disturbance, including pre-development and post-development elevation contours.
 - 4) Areas used for storage of soils or wastes.
 - 5) Areas where vegetative practices are to be implemented.
 - 6) Location of all erosion and sediment control BMP or structures.
 - 7) Location of all impervious structures and surfaces after project is completed.
 - 8) Springs, wetlands, and other surface waters located onsite.
 - 9) Boundaries of the 100-year floodplain, if determined.
 - 10) Ordinary High Water line, if determined.
 - 11) Location of storm drainage outfalls to receiving waters, if applicable.
 - 12) Details of sediment and erosion controls.
 - 13) Details of detention ponds, storm drain piping, inflow and outflow details.
 - c. Required BMPs and Procedures for Erosion Prevention, Runoff Control, and Sediment Control:
 - 1) Construction entrances and parking areas.
 - 2) Unpaved site roads such as haul roads.
 - 3) Hauling saturated soils from the Site.
 - 4) Water washed from concrete trucks.
 - 5) Correct installation of erosion and sediment control BMPs.
 - 6) Prompt maintenance and repair of BMPs.
 - 7) Clearing and grading practices to minimize area of exposed soil throughout life of the Project.
 - 8) Schedule of phased clearing operations to limit soils to what can be stabilized.
 - 9) Vegetative practices, including preservation of existing vegetation, seeding, mulching, and buffer strips.
 - 10) Preventing erosion of exposed areas.
 - 11) Diverting flows from exposed slopes.

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- 12) Limiting runoff from exposed areas.
 - 13) Limiting sediment transport within work sites and keeping it from moving off of project areas.
 - 14) Perimeter controls for all clearing and grubbing, both planned and installed.
 - 15) Additional controls for wet season work and temporary work suspensions.
 - 16) Sensitive areas such as wetlands.
 - 17) Offsite material source and waste areas.
 - 18) Dust.
 - 19) Emergency materials stockpiled onsite.
 - 20) Storing flows and filtering sediment.
 - 21) Soil stockpiles.
5. Contractor's construction TESC Plan and implementation schedules must be prepared by a competent individual. Furnish a signed copy of the TESC Plan with individual's name, title, state certifications, and employing firm if different than Contractor's firm.
 6. Do not begin any Site activities that have potential to cause erosion or sediment movement until the TESC Plan and implementation schedules are approved by Engineer.
 7. Keep a copy of the approved TESC Plan with updated changes onsite during all construction activities. During inactive periods longer than 7 calendar days, keep the TESC Plan onsite or provide a copy to Engineer to retain.
 8. Continually update the TESC Plan and schedules as needed for unexpected storm or other events to ensure that sediment-laden water does not leave the construction site. Add approved changes to the TESC Plan no later than 24 hours after implementation.
- E. Preventing erosion, and controlling runoff, sedimentation, and non-stormwater pollution, requires Contractor to perform temporary Work items including, but not limited to:
1. Providing ditches, berms, culverts, and other measures to control surface water.
 2. Building dams, settling basins, energy dissipaters, and other measures, to control downstream flows.
 3. Controlling underground water found during construction.
 4. Covering or otherwise protecting slopes until permanent erosion control measures are working.
- F. To the degree possible, coordinate this temporary Work with permanent drainage and erosion control work the Contract requires.

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- G. Engineer may require additional temporary control measures if it appears pollution or erosion may result from weather, nature of materials, or progress on the Work.
- H. When natural elements rut or erode the slope, restore and repair damage with eroded material where possible, and remove and dispose of any remaining material found in ditches and culverts. When Engineer orders replacement with additional or other materials, unit Contract prices will cover quantities needed.
- I. Install all sediment control devices including, but not limited to, sediment ponds, perimeter silt fencing, or other sediment trapping BMPs prior to any ground disturbing activity. Do not expose more erodible earth than necessary during clearing, grubbing, excavation, borrow, or fill activities without written approval by Engineer. Engineer may increase or decrease the limits based on project conditions. Erodible earth is defined as any surface where soils, grindings, or other materials may be capable of being displaced and transported by rain, wind, or surface water runoff. Cover inactive areas of erodible earth, whether at final grade or not, within specified time period (see [NPDES] Erosion and Sediment Control Permit), using an approved soil covering practice. Phase clearing and grading to maximum extent practical to prevent exposed inactive areas from becoming a source of erosion.
- J. Water Management:
 - 1. Manage site water in accordance with approved Dewatering Plan, to comply with state water quality criteria in 35 IAC Sections 302.208 and 302.210. Manage in accordance with the conditions of the water discharge permit-equivalent requirements or approval from local IEPA or authority. If site water management is not subject to regulation for compliance with state water quality standards, manage as follows:
 - a. Groundwater. When groundwater is encountered in an excavation, treat and discharge as follows:
 - 1) When groundwater conforms to Illinois Surface Water Quality Standards in 35 IAC Section 320.208 and 320.210, it may bypass detention and treatment facilities and be routed directly to its normal discharge point at a rate and method that will not cause erosion.
 - 2) When turbidity of groundwater is similar to turbidity of site runoff, groundwater may be treated using same detention and treatment facilities being used to treat the site runoff and then discharged at a rate that will not cause erosion.
 - 3) When groundwater turbidity is greater than turbidity of site runoff, treat ground water separately until turbidity is similar to or better than site runoff, and then it may be combined with site runoff and treated as described above.

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- b. Process Water:
 - 1) Do not discharge high pH process water or wastewater (non-stormwater) that is generated onsite, including water generated during concrete grinding, rubblizing, washout, and hydrodemolition activities, to waters of the Illinois, including wetlands. Water may be infiltrated upon approval of Engineer. Offsite disposal of concrete process water is subject to approval of Engineer.
 - 2) Treat all water generated onsite from construction or washing activities that is more turbid than site runoff separately until turbidity is the same or less than site runoff, and then it may be combined with site runoff and treated as described above. Water may be infiltrated upon approval of Engineer.
- c. Offsite Water: Prior to disruption of normal watercourse, intercept offsite stormwater and pipe it either through or around the Project Site. This water shall not be combined with onsite stormwater. Discharge offsite water at its preconstruction outfall point preventing an increase in erosion below the site. Submit proposed method for performing this Work in Dewatering Plan per Section 01 50 00, Temporary Facilities and Controls for Engineer's approval.
- K. Pollution Control: Use BMPs to prevent or minimize stormwater exposure to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery, as well as debris, leftover paints, solvents, and glues from construction operations. Implement the following BMPs when applicable:
 - 1. Written spill prevention and response procedures.
 - 2. Employee training on spill prevention and proper disposal procedures.
 - 3. Spill kits in all vehicles.
 - 4. Regular maintenance schedule for vehicles and machinery.
 - 5. Material delivery and storage controls.
 - 6. Training and signage.
 - 7. Covered storage areas for waste and supplies.
- L. If Engineer orders the Work suspended, continue to control erosion, pollution, and runoff during the shutdown.
- M. Nothing in this section shall relieve Contractor from complying with other Contract requirements.

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1.04 SUBMITTALS

A. Informational Submittals:

1. When a TESC Plan is included in the Drawings, either adopt or modify the TESC Plan. Provide a schedule for TESC Plan implementation and incorporate it into Contractor's progress schedule. Obtain Engineer's approval of the TESC Plan and schedule before any Work begins.
2. Modified TESC Plans shall meet all requirements of the applicable jurisdictions.
3. The TESC Plan shall cover all areas that may be affected inside and outside the limits of the Project (including all Owner-provided sources, disposal sites, and haul roads, and all nearby land, streams, and other bodies of water).
4. Allow at least 5 working days for Engineer to review any original or revised TESC Plan. Failure to approve all or part of any such Plan shall not make Owner liable to Contractor for any Work delays.

PART 2 PRODUCTS

2.01 CHECK DAMS

- A. Specified by Contractor with approval of Engineer.

2.02 COIR LOG

- A. Logs made of 100 percent durable coconut (coir) fiber uniformly compacted within woven netting.
- B. Netting: Made of bristle coir twine with minimum strength of 80 pounds tensile strength. Nominal 2-inch by 2-inch openings.
- C. Log Segments: Maximum length of 20 feet, with a minimum diameter as shown on the Drawings.
- D. Log Minimum Density: 7 lbs/cf.
- E. Stakes: Untreated softwood species with a notch to secure rope ties.
- F. Rope Ties: 1/4-inch diameter commercially available hemp rope.

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2.03 COMPOST SOCK

- A. Provide socks fabricated from of extra heavy weight biodegradable fabric, with a minimum strand thickness of 5 mils.
- B. Fill fabric with Coarse Compost.
- C. Diameter: 8 inches minimum.
- D. Fabric: Clean, evenly woven, and free of encrusted concrete or other contaminating materials. Shall be free from cuts, tears, broken or missing yarns. Shall be free of thin, open, or weak areas. Shall be free of any type of preservative.
- E. Wood Stakes: Untreated softwood species, be 2-inch by 2-inch nominal dimension and 36 inches in length.

2.04 EROSION CONTROL BLANKET (MATTING), BIODEGRADABLE

- A. Temporary erosion control blanket shall be made of natural plant fibers. Supply independent test results meeting the following:

Properties	ASTM Test Method	Requirements
Protecting Slopes from Rainfall-Induced Erosion	D6459: Test in one soil type. Soil tested shall be sandy loam as defined by the NRCS Soil Texture Triangle.	Maximum C factor of 0.15 using Revised Universal Soil Loss Equation (RUSLE)
Dry Weight per Unit Area	D6475	0.36 lb/sq. yd. minimum
Performance in Protecting Earthen Channels from Stormwater-Induced Erosion	D6460: Test in one soil type. Soil tested shall be loam as defined by the NRCS Soil Texture Triangle.	1.0 lb/sq. ft. minimum
Seed Germination Enhancement	D7322	200 percent minimum
Netting, if present, shall be biodegradable with a life span not to exceed 1 year.		

- B. For permanent erosion control blanket, see Section 31 32 00, Soil Stabilization.

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2.05 GEOTEXTILE

- A. Geotextiles shall consist only of long chain polymeric fibers or yarns formed into a stable network such that the fibers or yarns retain their position relative to each other during handling, placement, and design service life. At least 95 percent by weight of the material shall be polyolefins or polyesters. The material shall be free from defects or tears. Geotextile shall also be free of any treatment or coating which might adversely alter its hydraulic or physical properties after installation. Geotextile properties shall be as specified as described in Table 1 through Table 3.

Table 1 Geotextile for Permanent Erosion Control							
Geotextile Property	ASTM Test Method	Geotextile Property Requirements					
		Permanent Erosion Control				Ditch Lining	
		Moderate Survivability		High Survivability			
		Woven	Nonwoven	Woven	Nonwoven	Woven	Nonwoven
AOS	D4751	See Table 2		See Table 2		U.S. No. 30 max.	
Water Permittivity	D4491	See Table 2		See Table 2		0.02 sec ⁻¹ min.	
Grab Tensile Strength, in machine and x-machine direction	D4632/ D4632M	250 lb min.	160 lb min.	315 lb min.	200 lb min.	250 lb min.	160 lb min.
Grab Failure Strain, in machine and x-machine direction	D4632/ D4632M	15% -50%	≥50%	15% -50%	≥50%	<50%	≥50%
Seam Breaking Strength	D4632/ D4632M	220 lb min.	140 lb min.	270 lb min.	180 lb min.	220 lb min.	140 lb min.
Puncture Resistance	D6241	495 lb min.	310 lb min.	620 lb min.	430 lb min.	495 lb min.	310 lb min.
Tear Strength, in machine and x-machine direction	D4533	80 lb min.	50 lb min.	112 lb min.	79 lb min.	80 lb min.	50 lb min.
Ultraviolet (UV) Radiation Stability	D4355	70% strength retained min., after 500 hours in xenon arc device					

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Table 2 Filtration Properties for Geotextile for Permanent Erosion Control				
Geotextile Property	ASTM Test Method	Geotextile Property Requirements		
		Class A	Class B	Class C
AOS	D4751	U.S. No. 40 max.	U.S. No. 60 max.	U.S. No. 70 max.
Water Permittivity	D4491	0.7 sec ⁻¹ min.	0.4 sec ⁻¹ min.	0.2 sec ⁻¹ min.

Table 3 Geotextile for Temporary Silt Fence			
Geotextile Property	ASTM Test Method	Geotextile Property Requirements	
		Unsupported Between Posts	Supported Between Posts with Wire or Polymeric Mesh
AOS	D4751	U.S. No. 30 max. for silt wovens, U.S. No. 50 for all other geotextile types, U.S. No. 100 min.	
Water Permittivity	D4491	0.2 sec ⁻¹ min.	
Grab Tensile Strength, in machine and x-machine direction	D4632/D4632M	180 lb min. in machine direction, 100 lb min. in x-machine direction	100 lb min.
Grab Failure Strain, in machine and x-machine direction	D4632/D4632M	30% max. at 180 lb or more	
Ultraviolet (UV) Radiation Stability	D4355	70% strength retained min., after 500 hours in xenon arc device	

2.06 GRAVEL FILTER, WOOD CHIP OR COMPOST BERM

- A. Rock Material Used for Filter Berms: Clean 3/4-inch rock, with no recycled materials.
- B. Wood Chips Used for Wood Chip Berm: As specified in Article Wood Chips and Wood Shavings.
- C. Compost Used for Compost Berms: Coarse compost as specified in Article Compost Blanket.

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2.07 MULCH

- A. Short-Term: Provide independent test results documenting that the mulch meets the requirements in Table 4, Short-Term Mulch Test Requirements.

Table 4 Short-Term Mulch Test Requirements		
Properties	Test Method	Requirements
Performance in Protecting Slopes from Rainfall-Induced Erosion.	ASTM D6459. Test in one soil type. Soil tested shall be sandy loam as defined by the National Resources Conservation Service (NRCS) Soil Texture Triangle.	C Factor = 0.15 maximum using Revised Universal Soil Loss Equation (RUSLE)

- B. Moderate-Term: Within 48 hours of application, the Moderate-Term Mulch shall bond with soil surface to create a continuous, absorbent, flexible, erosion-resistant blanket that allows for seed germination and plant growth and conforms to the requirements in Table 5, Moderate-Term Mulch Test Requirements. Provide test results documenting that the mulch meets the requirements in Table 5, Moderate-Term Mulch Test Requirements. Supply independent test results.

Table 5 Moderate-Term Mulch Test Requirements		
Properties	Test Method	Requirements
Performance in Protecting Slopes from Rainfall-Induced Erosion.	ASTM D6459. Test in one soil type. Soil tested shall be sandy loam as defined by the NRCS Soil Texture Triangle.	C Factor = 0.05 maximum using Revised Universal Soil Loss Equation (RUSLE)

- C. Long-Term:
1. Provide Long-Term Mulch with demonstrated ability:
 - a. To adhere to soil and create a blanket-like mass within 2 hours of application.
 - b. To bond with the soil surface to create a continuous, porous, absorbent, and flexible erosion-resistant blanket that allows for seed germination and plant growth.
 - c. To conform to the requirements in Table 6, Long-Term Mulch Test Requirements.
 - d. Provide test results documenting that mulch meets requirements in Table 6, Long-Term Mulch Test Requirements. Supply independent test results.

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Table 6 Long-Term Mulch Test Requirements		
Properties	Test Method	Requirements
Performance in Protecting Slopes from Rainfall-Induced Erosion.	ASTM D6459. Test in one soil type. Soil tested shall be sandy loam as defined by the NRCS Soil Texture Triangle.	C Factor = 0.01 maximum using Revised Universal Soil Loss Equation (RUSLE)

2.08 PLASTIC COVERING

- A. Clear plastic meeting requirements of ASTM D4397 for polyethylene sheeting having a minimum thickness of 6 mils.

2.09 POLYACRYLAMIDE (PAM)

- A. Meet ANSI/NSF Standard 60 for drinking water treatment with an AMD content not to exceed 0.05 percent.
- B. Anionic, linear, and not cross-linked.
- C. Minimum average molecular weight greater than 5 mg/mole and minimum 30 percent charge density.
- D. 80 percent active ingredients minimum with moisture content not exceeding 10 percent by weight.
- E. Delivered in a dry granular or powder form.

2.10 SEDIMENT CONTROL BARRIERS

- A. Specified by Contractor with approval of Engineer. May include Compost Filter Sock or Compost Filter Berm.

2.11 SEEDING

- A. See Section 32 92 00, Turf and Grasses.

2.12 SILT (SEDIMENT) FENCE

- A. Geotextile: As specified in Article Geotextile.
- B. Support Posts: As recommended by manufacturer of geotextile.
- C. Fasteners: Heavy-duty wire staples at least 1-inch long, tie wires, or hog rings, as recommended by manufacturer of geotextile.

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2.13 STABILIZED CONSTRUCTION ENTRANCE

- A. Construct a pad from stone 3 inches to 6 inches in size, placed at least 8 inches deep and not less than 50 feet long.
- B. Provide aggregate free of extraneous materials that may cause or contribute to track out.
- C. Place separation geotextile under the rock to prevent fine sediment from pumping up into the rock pad. See Article Geotextile for required geotextile properties.
- D. Use of constructed or constructed/manufactured steel plates with ribs (such as, shaker/rumble plates or corrugated steel plates) for entrance/exit access is allowable.

2.14 STRAW BALE BARRIER

- A. Straw:
 - 1. Air dried condition free of noxious weeds, seeds, and other materials detrimental to plant life. Hay is not acceptable. Provide weed-free documentation:
 - a. Certified Weed Free Straw using North American Weed Management Association (NAWMA) standards.
 - b. Provide documentation that material is steam or heat treated to kill seeds.
 - c. Provide U.S. or state's Department of Agriculture laboratory test reports, dated within 90 days prior to date of application, showing there are no viable seeds in the straw.
- B. Straw Mulch: Suitable for spreading with mulch blower equipment.
- C. Posts for Straw Bales: 2-inch by 2-inch untreated wood or commercially manufactured metal posts.

2.15 STREET CLEANING

- A. Use self-propelled pickup street sweeper(s). Mechanical broom sweepers are not allowed where environmental concerns exist about storm water pollution or air quality.

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2.16 TACKIFIERS

- A. Biodegradable Hydraulically Applied Erosion Control Products (HECPs) in a dry condition, free of noxious weeds, seeds, chemical printing ink, germination inhibitors, herbicide residue, chlorine bleach, rock, metal, plastic, and other materials detrimental to plant life. Up to 5 percent by weight may be photodegradable material.
- B. Suitable for spreading with a hydroseeder.
- C. Furnish HECPs premixed by the manufacturer. Under no circumstances will field mixing of additives or components be acceptable.
- D. Provide test results, dated within 3 years prior to the date of application, from an independent, accredited laboratory, as approved by Engineer, showing that the product meets the HECP requirements in Table 7.

Table 7 HECP Requirements		
Properties	Test Method	Requirements
Acute Toxicity	EPA-821-R-02-012 Methods for Measuring Acute Toxicity of Effluents. Test leachate from recommended application rate receiving 2 inches of rainfall per hour using static test for No- Observed-Adverse- Effect-Concentration (NOEC).	Four replicates are required with no statistically significant reduction in survival in 100 percent leachate for a Daphnid at 48 hours and Oncorhynchus mykiss (rainbow trout) at 96 hours.
Solvents	EPA 8260B	Benzene: < 0.03 mg/kg Methylene chloride: < 0.02 mg/kg Naphthalene: < 5 mg/kg Tetrachloreoethylene: < 0.05 mg/kg Toluene: < 7 mg/kg Trichloroethylene: < 0.03 mg/kg Xylenes: < 9 mg/kg

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<p style="text-align: center;">Table 7 HECP Requirements</p>		
Properties	Test Method	Requirements
Heavy Metals	EPA 6020A Total Metals	Antimony: < 4 mg/kg Arsenic: < 6 mg/kg Barium: < 80 mg/kg Boron: < 100 mg/kg Cadmium: < 2 mg/kg Chromium: < 2 mg/kg Copper: < 5 mg/kg Lead: < 5 mg/kg Mercury: < 2 mg/kg Nickel: < 2 mg/kg Selenium: < 10 mg/kg Strontium: < 30 mg/kg Zinc: < 5 mg/kg
Water Holding Capacity	ASTM D7367	900 percent minimum
Organic Matter Content	ASTM D2974	90 percent minimum
Moisture Content	ASTM D2974	15 percent
Seed Germination Enhancement	ASTM D7322	Long-Term: 420 percent minimum Moderate-Term: 400 percent minimum Short-Term: 200 percent minimum

2.17 TIRE WASH FACILITY

- A. Specified by Contractor with approval of Engineer. Wheel wash facilities should have a non-erosive base, and a small grade change, 6 inches to 12 inches for a 10-foot-wide pond, to allow sediment to flow to low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2-foot to 3-foot riser should be installed at low side of pond to allow for cleaning and refilling. Pond should be deep enough to hold 14 inches of water after displacement. Alternatively, pressure washing combined with an adequately-sized and adequately-surfaced pad with direct drainage to a 10-foot by 10-foot sump can be very effective.

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2.18 WATTLES

- A. Cylinders of biodegradable plant material such as weed-free straw, coir, compost, wood chips, excelsior, or wood fiber or shavings encased within biodegradable netting.
- B. Diameter: 5 inches minimum.
- C. Netting Material: Clean, evenly woven, and free of encrusted concrete or other contaminating materials such as preservatives. Also free from cuts, tears, or weak places with a minimum lifespan of 6 months.
- D. Compost Filler: Coarse compost, wood chips, or wood shavings.
- E. Wood Stakes: Untreated softwood species, 2-inch by 2-inch nominal dimension and 36 inches in length.

PART 3 EXECUTION

3.01 PREPARATION

- A. Engineer's acceptance of the TESC Plan is required prior to starting earth disturbing activities.
- B. Include proposed stockpile areas and installation of temporary erosion control devices, ditches, or other facilities in Work phasing plans.
- C. Areas designated for Contractor's use during Project may be temporarily developed as specified to provide working, staging, and administrative areas. Include control of sediment from these areas in the TESC Plan.
- D. Check Dams: Install check dams as soon as construction will allow, or when designated by Engineer. Contractor may substitute a different check dam, in lieu of what is specified in the Contract, with approval of Engineer. Check dam is a temporary or permanent structure, built across a minor channel. Water shall not flow through check dam structure. Construct check dams to create a ponding area upstream of dam to allow pollutants to settle, with water from increased flows channeled over a spillway in check dam. Construct check dam to prevent erosion in area below spillway. Place check dams perpendicular to flow of water and install in accordance with the Drawings. Extend outer edges up sides of conveyance to prevent water from going around check dam. Provide check dams of sufficient height to maximize detention, without causing water to leave ditch. Place sandbags so that initial row makes tight contact with ditch line for length of dam. Stagger subsequent rows so center of bag is placed over space between bags on previous lift.

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- E. Coir Log: Install coir logs in accordance with the Drawings.
- F. Compost Sock: Exercise care when installing compost socks to ensure method of installation minimizes disturbance of waterways and prevents sediment or pollutant discharge into waterbodies. Lace compost socks together, end-to-end, with coir rope to create a continuous length. Bury loose ends of continuous length 3 feet to 5 feet laterally into the bankslope. Install the upper surface of compost sock parallel to slope. Provide finished grades of a natural appearance with smooth transitions. Secure compost sock with wood stakes or live stakes of species as indicated on the Drawings. Drive stakes into place centered on top of compost sock and spaced 3 feet on center throughout length of sock.
- G. Erosion Control Blanket (Matting), Biodegradable: Temporary Erosion Control Blankets are used as an erosion prevention device and to enhance establishment of vegetation. Install erosion control blankets according to manufacturer's recommendations.
 - 1. Erosion control blankets with an open area of 60 percent or greater may be installed prior to seeding and fertilizing. Install blankets with less than 60 percent open space immediately following seeding and fertilizing operation.
 - 2. Select erosion control blanket material for an area based on the intended function; slope or ditch stabilization and Site-specific factors including soil, slope gradient, rainfall, and flow exposure. Do not use erosion Control Blankets on slopes or in ditches that exceed manufacturer's recommendations.
 - 3. For permanent erosion control blanket, see Section 31 32 00, Soil Stabilization.
- H. Gravel Filter, Wood Chip, or Compost Berm: Construct filter berms to retain sediment and direct flows.
 - 1. Gravel Filter Berm: 1-foot minimum height. Maintain at this height for entire time berm is in use.
 - 2. Wood Chip Berm: 2-foot minimum height. Maintain at this height for entire time berm is in use.
 - 3. Construct compost berm of course compost in accordance with the detail on Drawings.
- I. Mulch: Furnish, haul, and evenly apply at rates indicated and spread on seeded areas within 48 hours after seeding unless otherwise specified.
 - 1. Distribute straw mulch material with an approved mulch spreader that uses forced air to blow mulch material on seeded areas.
 - 2. Apply wood strand mulch by hand or by straw blower on seeded areas.

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3. Hydraulically apply Short-Term Mulch at the rate of 2,500 pounds per acre. May be applied in one lift.
 4. Hydraulically apply Moderate-Term Mulch and Long-Term Mulch at the rate of 3,500 pounds per acre with no more than 2,000 pounds applied in any single lift. Mulch may be applied with seed and fertilizer in moist climates. In dry climates, apply seed and fertilizer in a single application followed by mulch application. Provide mulch suitable for application with a hydroseeder.
 5. Cover temporary seed applied outside application windows established in Section 32 92 00, Turf and Grasses, with a mulch containing either Moderate-Term Mulch or Long-Term Mulch, as designated by Engineer.
 6. Mulch areas not accessible by mulching equipment by approved hand methods.
- J. Plastic Covering: Use clear plastic covering to promote seed germination when seeding is performed outside of specified dates. Use black plastic covering for stockpiles or other areas where vegetative growth is unwanted. Place plastic with at least a 12-inch overlap of all seams. Install and maintain plastic cover to prevent water from cutting under the plastic and to prevent cover from blowing open in the wind.
- K. Polyacrylamide (PAM): See Tackifiers.
- L. Sediment Control Barriers: Install sediment control barriers in accordance with TESC Plan or manufacturer's recommendations in the areas of clearing, grubbing, earthwork, or drainage prior to starting those activities. Maintain sediment control barriers until soils are stabilized.
- M. Seeding: See Section 32 92 00, Turf and Grasses.
- N. Silt (Sediment) Fence:
1. Silt fence shall be installed in accordance with the Drawings. When backup support is used, use steel wire with a maximum mesh spacing of 2 inches by 4 inches, or plastic mesh as resistant to ultraviolet radiation as the geotextile it supports. Provide wire or plastic mesh with strength equivalent to or greater than as required for unsupported geotextile (for example, 180 pounds grab tensile strength in the machine direction).
 2. Attach geotextile to posts and support system using staples, wire, or in accordance with manufacturer's recommendations. Geotextile shall be sewn together at the point of manufacture, or at a location approved by Engineer, to form geotextile lengths as required.
 3. Provide wood or steel support posts at sewn seams and overlaps and as shown on the Drawings and necessary to support fence.

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4. Wood Posts: Minimum dimensions of 1-1/4-inch by 1-1/4-inch by the minimum length shown on the Drawings.
 5. Steel Posts: Minimum weight of 0.90 lb/ft.
 6. When sediment deposits reach approximately one-third the height of the silt fence, remove and stabilize deposits.
- O. Stabilized Construction Entrance: Construct temporary stabilized construction entrance in accordance with the Drawings, prior to beginning any clearing, grubbing, earthwork, or excavation. When stabilized entrance no longer prevents track out of sediment or debris, either rehabilitate existing entrance to original condition or construct a new entrance.
- P. Street Cleaning: Use self-propelled pickup street sweepers whenever required by Engineer to prevent transport of sediment and other debris off Project Site. Provide street sweepers designed and operated to meet air quality standards. Street washing with water will require approval by Engineer. Intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.
- Q. Tackifiers:
1. Mix and apply tackifier in accordance with manufacturer's recommendations. If applied with a hydroseeder, add Short-Term Mulch as a tracer at a rate of 125 pounds to 250 pounds per acre to visibly aid uniform application.
 2. Soil Binding Using Polyacrylamide (PAM): Apply PAM on bare soil completely dissolved and mixed in water or applied as a dry powder. Apply dissolved PAM at a rate of not more than 2/3 pound per 1,000 gallons of water per acre. Apply a minimum of 200 pounds per acre of Short-Term Mulch with the dissolved PAM. Dry powder applications may be at a rate of 5 pounds per acre using a hand-held fertilizer spreader or a tractor-mounted spreader.
 - a. Apply PAM only to areas that drain to completed sedimentation control BMPs in accordance with the TESC Plan. PAM may be reapplied on actively worked areas after a 48-hour period.
 - b. PAM shall not be applied during rainfall or to saturated soils.
- R. Tire Wash Facility: When the Contract requires a tire wash (in conjunction with a stabilized entrance), include details for tire wash and method for containing and treating sediment-laden runoff as part of the TESC Plan. All vehicles leaving the Site shall stop and wash sediment from their tires. Keep the water level 12 inches to 14 inches deep. Change wash water a minimum of once per day. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 pound to 0.5 pound per 1,000 gallons of water increases effectiveness and reduces cleanup time.

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- S. Wattles: Install wattles as soon as construction will allow or when designated by Engineer. Begin trench construction and wattle installation at base of slope and work uphill. Spread excavated material evenly along the uphill slope and compact using hand tamping or other method approved by Engineer. On gradually sloped or clay-type soils, provide trenches 2 inches to 3 inches deep. On loose soils, in high rainfall areas, or on steep slopes, provide trenches 3 inches to 5 inches deep, or half the thickness of the wattle. Exercise care when installing wattles to minimize disturbance of waterways and prevent sediment or pollutant discharge into waterbodies.

3.02 ADDITIONAL REQUIREMENTS

- A. Natural Buffer or Equivalent:
 - 1. Unless natural buffer between the Project Site and receiving waters has previously been eliminated by pre-existing development disturbances, comply with one of the following alternatives if stormwater from construction will discharge to surface water:
 - a. Provide a 50-foot, undisturbed natural buffer between construction disturbances and surface water.
 - b. Provide an undisturbed natural buffer that is less than 50 feet supplemented by additional erosion and sediment controls, which in combination, achieve a sediment load reduction that is equivalent to a 50-foot buffer.
 - c. If it is infeasible to provide an undisturbed natural buffer of any size, implement erosion and sediment controls that achieve a sediment load reduction that is equivalent to a 50-foot buffer.

3.03 MAINTENANCE

- A. The ESCP measures described in this specification are minimum requirements for anticipated Site conditions. During the construction period, upgrade these measures as needed to comply with all applicable local, state, and federal erosion and sediment control regulations.
- B. Maintain erosion and sediment control BMPs so they properly perform their function until Engineer determines they are no longer needed.
- C. Construction activities must avoid or minimize excavation and creation of bare ground during wet weather.
- D. The intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.
- E. Inspect BMPs in accordance with the schedule in the Construction Stormwater Discharge Permit(s) or as directed by Engineer.

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- F. Complete an inspection report within 24 hours of an inspection. Each inspection report shall be signed and identify corrective actions. Document that corrective actions are performed within 7 days of identification. Keep a copy of all inspection reports at the Site or at an easily accessible location.
- G. Unless otherwise specified, remove deposits before the depth of accumulated sediment and debris reaches approximately height of BMP. Dispose of debris or contaminated sediment at approved locations. Clean sediments may be stabilized onsite using BMPs as approved by Engineer.
- H. Sediment Fence: Remove trapped sediment before it reaches one-third of the above ground fence height and before fence removal.
- I. Other Sediment Barriers (such as biobags): Remove sediment before it reaches 2 inches depth above ground height and before BMP removal.
- J. Initiate repair or replacement of damaged erosion and sediment control BMPs immediately, and work completed by end of next work day. Significant replacement or repair must be completed within 7 days, unless infeasible.
- K. Within 24 hours, remediate any significant sediment that has left construction site. Investigate cause of the sediment release and implement steps to prevent a recurrence of discharge within same 24 hours. Perform in-stream cleanup of sediment according to applicable regulations.
- L. At end of each work day, stabilize or cover soil stockpiles or implement other BMPs to prevent discharges to surface waters or conveyance systems leading to surface waters.
- M. Temporarily stabilize soils at end of shift before holidays and weekends, if needed. Ensure soils are stable during rain events at all times of year.
- N. Initiate stabilization by no later than end of next work day after construction work in an area has stopped permanently or temporarily.
- O. Within 14 days of initiating stabilization or as specified in permit, either seed or plant stabilized area (see Section 32 92 00, Turf and Grasses); or apply non-vegetative measures and cover all areas of exposed soil. Seed dry areas as soon as Site conditions allow. Ensure that vegetation covers at least 70 percent of stabilized area. In areas where Contractor's activities have compromised erosion control functions of existing grasses, over-seed existing grass. Non-vegetative measures may include blown straw and a tackifier, loose straw, or an adequate covering of compost mulch. Complete initial stabilization within 7 days if storm water discharges to surface waters impaired for sediment or nutrients, or high quality waters.

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- P. Provide permanent erosion control measures on all exposed areas. Do not remove temporary sediment control practices until permanent vegetation or other cover of exposed areas is established. However, do remove all temporary erosion control measures as exposed areas become stabilized, unless doing so conflicts with local requirements. Properly dispose of construction materials and waste, including sediment retained by temporary BMPs.

3.04 REMOVAL

- A. When Engineer determines that an erosion control BMP is no longer required, remove BMP and all associated hardware from the Project limits. When materials are biodegradable, Engineer may approve leaving temporary BMP in place.
- B. Permanently stabilize all bare and disturbed soil after removal of erosion and sediment control BMPs. Dress sediment deposits remaining after BMPs have been removed to conform to existing grade. Prepare and seed graded area. If installation and use of erosion control BMPs have compacted or otherwise rendered soil inhospitable to plant growth, such as construction entrances, take measures to rehabilitate soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or seeding with specified seed.

3.05 MEASUREMENT AND PAYMENT

- A. Check Dams will be measured per linear foot one time only along the completed check dam. Unit Contract Price per linear foot for Check Dam shall be full pay for all equipment, labor, and materials to perform the Work as specified, including installation, removal, and disposal at an approved disposal site. No additional measurement will be made for check dams required to be rehabilitated or replaced as a result of wear or improper installation.
- B. Coir Log will be measured by linear foot along ground line of completed installation. Unit Contract Price per linear foot for Coir Log shall be full pay for all equipment, labor, and materials to perform the Work as specified, including installation, removal, and disposal at an approved disposal site.
- C. Compost Sock will be measured by linear foot. Unit Contract Price for Compost Sock shall include removal and disposal of compost sock fabric if photodegradable fabric is not used.
- D. Erosion Control Blanket (matting) will be measured by square yard along ground slope line of surface area covered and accepted. Unit Contract price per square yard for Erosion Control Blanket shall be full pay for all costs to complete the specified Work.

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- E. ESC Lead will be measured per day for each day that an inspection is made and a report is filed.
- F. Gravel Filter, Wood Chip, or Compost Berm will be measured by linear foot along ground line of completed installation. Unit Contract Price per linear foot of berm shall be full pay for all equipment, labor, and materials to perform the Work as specified, including installation, removal, and disposal at an approved disposal site.
- G. Mulch will be measured by the acre by ground slope measurement or through use of design data.
- H. Natural Buffer or Equivalent: No additional payment will be made for providing a Natural Buffer or Equivalent on the Project Site.
- I. Plastic Covering will be measured by the square yard along ground slope line of surface area covered and accepted. Unit Contract Price per square yard for Plastic Covering shall be full pay for all equipment, labor, and materials to perform the Work as specified, including removal and disposal at an approved disposal site.
- J. Polyacrylamide (PAM). See Tackifiers.
- K. Sediment Control Barrier will be measured by linear foot along ground line of completed barrier.
- L. Seeding: See Section 32 92 00, Turf and Grasses.
- M. Silt (Sediment) Fence will be measured by linear foot along ground line of completed installation.
- N. Stabilized Construction Entrance will be measured by square yard for each entrance constructed.
- O. Street Cleaning will be measured by the hour for actual time spent cleaning pavement, as authorized by Engineer. Time to move equipment to or from the area on which street cleaning is required, will not be measured.
- P. Tackifiers (Polyacrylamide) will be measured by the acre by ground slope measurement or calculated by use of design data. Unit Contract Price per acre for Tackifier shall be full payment for all costs incurred to complete the Work.
- Q. Tire Wash facility will be measured per each for each wash installed. Unit Contract Price per each for tire wash shall include all costs associated with constructing, operating, maintaining, and removing the tire wash.

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- R. Wattles will be measured by the linear foot.
- S. Erosion Control will be measured and paid on a lump sum basis. Erosion Control includes:
1. Providing the ESC Lead.
 2. Developing, revising, and documenting TESC Plan.
 3. Mobilization.
 4. Monitoring activities.
 5. Furnishing, stockpiling, protecting, restocking, and removing emergency materials.
 6. Preparing Project for winter shutdown.
 7. Inspecting, maintaining, and removing erosion control devices.
 8. Restoring, mulching, tacking, and seeding all disturbed ground, work, and storage areas not otherwise covered.
- T. No separate or additional payment will be made for:
1. Removing and disposing of sediment build-up behind sediment fences and sediment barriers.
 2. Removing and reinstalling required appurtenances to modify temporary slope drains as the embankment slopes are changed.
 3. Constructing and removing temporary slope berms.
 4. Applying dust control.
 5. Erosion control for work outside construction limits including, but not limited to, borrow pits, haul roads, disposal sites, and equipment storage sites.
- U. When only Erosion Control is listed in the Contract Schedule of Items, no separate or additional payment will be made for modifications or additions to the BMPs that become necessary for permit compliance during construction.

END OF SECTION

SECTION 01 57 28
TEMPORARY FLOW CONTROL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. Institute of Inspection, Cleaning, and Restoration Certification (IICRC): S500, Standard and Reference Guide for Professional Water Damage Restoration.

1.02 DEFINITIONS

- A. Bypass Pumping: Temporary flow control accomplished by diverting flow away from the Work area using one or more pumps.
- B. Temporary Flow Control: Reducing, limiting, or excluding flow in or to a sanitary sewer, storm sewer, pump station, force main, or other facility as required for performing the Work under the Contract. Draining, handling, and disposal of sanitary sewage and stormwater from pipelines and other facilities as required for performing the Work under the Contract is also part of temporary flow control.
- C. Temporary Flow Control Plan: Plan prepared by Contractor containing complete information on how Contractor proposes to perform temporary flow control in accordance with specified requirements.

1.03 SYSTEM DESCRIPTION

- A. Provide facilities and controls required to intercept, convey, and discharge flow to be controlled; include standby and emergency equipment.
- B. Conform to regulatory requirements.
- C. Protect water resources, wetlands, and other natural resources.
- D. Temporary flow control shall be done in a manner that will not damage private or public property, or create a nuisance or public menace. Flow shall be conveyed in enclosed pipes that are adequately protected from traffic or other hazards.

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E. Discharge:

1. As directed by the Engineer.
2. Dumping or free flow on private or public property, gutters, streets, or sidewalks is prohibited.
3. Discharge of sanitary sewage to storm sewers, to surface waters or wetlands, or into the ground, is prohibited.

1.04 SITE CONDITIONS

- A. Obtain approval and secure permits for placement of temporary flow control facilities within public right-of-ways.

1.05 SUBMITTALS

A. Informational Submittals:

1. Temporary Flow Control Plan.
2. Emergency Cleanup Plan.
3. Special permits required for temporary flow control.
4. Names and qualifications of industrial hygienist and standby cleanup Subcontractor, including but not limited to, certification by IICRC.
5. Information describing equipment and materials to be used and showing conformance with specified requirements.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Industrial Hygienist and Cleanup Subcontractor: Certified by IICRC.
2. Temporary Flow Control System Designer: Professional engineer who has at least 5 years' experience in design of such systems and who is registered in the State of Illinois.

B. Regulatory Requirements:

1. As required by federal, state, and local government agencies and all authorities having jurisdiction.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Install temporary flow control facilities only within public right-of-way, Owner's property, temporary construction easement, permanent easement, or easement obtained by Contractor.
- B. Operate and maintain temporary flow control 24 hours per day, 7 days per week, including without limitation, holidays, as required to control flows.
- C. Promptly remove temporary flow control facilities as soon as they are no longer needed.

3.02 REQUIRED TEMPORARY FLOW CONTROL

- A. Except at pipe sags, depth of flow during television inspection and joint testing shall not exceed that shown below for respective pipe sizes:

Maximum Depth of Flow in Inches	
Pipe Size (Inches)	Television Inspection and Joint Testing
6	1.20
8	1.60
10	2.00
12	3.00
15	3.75
18	4.50
21	5.25
24	6.00
27	8.00
30	9.00
33 and up	30% of Pipe Diameter

- B. Eliminate flow from sewer manhole to manhole segments during spot repair, manhole construction, sewer pipe replacement or lining within that segment.

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3.03 EQUIPMENT AND MATERIALS

A. General:

1. Provide materials and equipment that will ensure continuous and successful operation of temporary flow control systems.
2. Repair or modify systems as necessary.
3. Unless otherwise shown or specified, materials and equipment may be new or used at Contractor's option.

B. Plugs:

1. Provide with taps for connection of pressure gauges and air hoses, and flow-through capability.
2. Pipe Diameters 24 Inches and Smaller: Use mechanical plugs with rubber gaskets or pneumatic plugs with rubber boots.
3. Pipe Diameters Larger than 24 Inches:
 - a. Use inflatable bag stoppers made in two or more pieces.
 - b. Manufacturers:
 - 1) Lansas.
 - 2) Cherne Industries.

C. Pumps:

1. Fully automatic, self-priming units that do not require use of foot valves or vacuum pumps in priming system.
2. Solids handling design with ability to pump minimum 3-inch diameter sphere.
3. Able to run dry for long periods of time to accommodate cyclical nature of flows.
4. Engine: Equipped to minimize noise. Noise levels shall not exceed 86 dBA at a distance of 50 feet from source.

D. Electric Power Generators:

1. Be able to simultaneously start and run electric powered pumps required for flow to be controlled.
2. Equipped to minimize noise. Noise levels shall not exceed 86 dBA at a distance of 50 feet from source.
3. Include automatic transfer switch if flow control system is to operate unattended.

E. Standby Equipment:

1. Standby Pump: One of each size to be available onsite.

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2. Electric Power Generators: Minimum of one if temporary flow control system contains electric powered pump. Able to simultaneously start and run electric powered pumps required for flow to be controlled.

3.04 TEMPORARY FLOW CONTROL PLAN

- A. Prepare and submit Temporary Flow Control Plan at least 30 days before starting the Work requiring temporary flow control; include following information:
 1. Drawings indicating location of temporary sewer plugs and bypass discharge lines.
 2. Traffic Control Plan specifically applicable to temporary flow control adhering to requirements of applicable agencies and as may be specified in Contract Documents.
 3. Locations where flow will be intercepted and discharged.
 4. If trucks are to be employed include the following:
 - a. Numbers and sizes of trucks.
 - b. Configuration of facilities to be used to load trucks at each interception location.
 - c. Locations where trucks will unload.
 - d. Time for loading, unloading, and travel.
 5. Complete descriptions and performance characteristics of pumps, electric power generators, and standby equipment.
 6. Acoustical information for equipment to be used showing compliance with noise control requirements of Section 01 50 00, Temporary Facilities and Control.
 7. Details of temporary force mains, including horizontal and vertical alignments, pipe materials, protection of existing buried and aboveground facilities and improvements, maintenance of traffic and access to properties.
 8. Design calculations proving adequacy of temporary system and selected equipment to convey all flows.
 9. Drawings showing layouts and configurations of temporary flow control facilities and also showing locations relative to right-of-way easement, and property boundaries.
 10. Drawings and design calculations of temporary bulkheads and plugs.
 11. Drawings and design calculations for thrust restraint of temporary piping.
 12. Details of system controls and control logic; include diagrams and narrative.
 13. Anticipated schedule for the Work.
 14. Other information to completely describe temporary flow control facilities and conformance to specified requirements.
 15. Anticipate coordination needs with Engineer.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

3.05 EMERGENCY CLEANUP PLAN

- A. Prepare and submit not less than 60 days before scheduled date of temporary flow control activities. As a minimum plan shall include the following:
 - 1. Procedures for removal of water.
 - 2. Procedures for determining nature and extent of damage and required restoration where restoration is possible.
 - 3. Provide for industrial hygienist and standby Subcontractor for cleanup of exterior and building interior spaces that might be affected by a spill, backup, or overflow. Industrial hygienist and cleanup Subcontractor shall be certified by IICRC and follow IICRC S500 for cleanup of Category 3 water.
- B. Implement for Full Scale Test and during temporary flow control.

3.06 BLOCKING FLOW

- A. Flow control may consist of blocking flow with mechanical or pneumatic plugs if only small amount of flow needs to be controlled and adequate storage is available.
- B. Use primary and secondary plugs for each flow control location.
- C. When blocking flow is no longer needed for performance and acceptance of the Work, remove plugs in a manner that permits sewage flow to slowly return to normal without surcharging or causing other major disturbances downstream.
- D. Remove temporary plugs at end of each working day and restore normal flow. If downstream work is not or cannot be completed during workday provide, operate, and maintain bypass pumping system or other method of flow control to accommodate flows.

3.07 PIPING

- A. Minimize disturbance of existing utilities.
- B. Where temporary flow control pipelines cross streets and private driveways, install pipeline in trench and cover with temporary pavement.
- C. Installation of bypass pipelines is prohibited in salt marsh/wetland areas.

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3.08 TEMPORARY SANITARY SEWAGE FLOW REDUCTION

- A. Contractor may request sewer service customers upstream of the Work area to reduce or curtail sewer flow.
 - 1. First Notice: Not less than 1 week nor more than 2 weeks prior to when sewer flow deduction or curtailment is requested.
 - 2. Second Notice: Not more than 24 hours nor less than 12 hours prior to when sewer flow deduction or curtailment is requested.
- B. When service lateral must be disconnected from main for more than 1 day, lateral shall be positively drained or pumped a minimum of once every 24 hours. Monitor status of flow and storage. Pump lateral more frequently where flows exceed storage capacity of lateral or temporary storage as may be provided by Contractor.
- C. Temporarily restore full flow services in uncompleted sections during nonwork hours.
- D. Promptly notify sewer service customers that were requested to reduce or curtail sewer flow when the Work is complete and full uninterrupted service restored.
- E. Contractor shall be responsible for control of sewage flows and under no circumstances be entitled to rely on flow reduction or curtailment by upstream sewer service customers.

3.09 DRAINING EXISTING PIPELINE

- A. Before initiating shutdown, ensure required materials, equipment, and labor are available onsite. Excavate and expose portions of existing pipeline to be removed.
- B. Provide tap and piping in place to drain sewage from existing pipeline before it is cut and to capture contents that may drain out when pipe is cut.
- C. Sewage drained shall be conveyed and discharged as directed by the Engineer.

3.10 FIELD QUALITY CONTROL

- A. Hydrostatic Pressure Test for Pump Bypass Systems:
 - 1. Prior to operation, test each section of discharge piping with maximum pressure equal to 1.5 times maximum operating pressure of system.
 - 2. Notify Engineer 24 hours prior to testing.

FACILITY AREA REMEDIAL DESIGN
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B. Full Scale Test:

1. At least 14 days prior to test, notify Engineer of date and time of test.
2. Do not begin temporary flow control activities until successful test has been completed.
3. Conduct on proposed temporary flow control at least 14 days before scheduled date of actual proposed temporary flow control.
4. Purpose of test is to demonstrate capability, function, and reliability of Contractor's proposed method of temporary flow control.
5. Duration: Minimum of 4 hours.
6. Conduct between 8:00 a.m. and 4:00 p.m. Do not conduct test on Saturday, Sunday, or holiday.
7. If electric pumps are being used, provide standby generators to ensure continuity of pumping operation in event of power failure.
8. Demonstrate system controls and operation, reliability, and transfer to standby equipment during test.
9. Conduct until flow is accommodated for minimum specified test duration.
10. Failure:
 - a. Test shall be deemed to have failed if during test flows are not accommodated for whatever reason and for whatever length of time.
 - b. If test fails, determine and correct deficiencies that caused test to fail and conduct another Full Scale Test.
11. Determination by Engineer of a successful test, permission by Engineer to proceed with the Work requiring temporary flow control, or anything else shall not relieve Contractor from responsibility to provide temporary flow control.

END OF SECTION

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Submit prior to application for final payment.
 - a. Record Documents: As required in General Conditions.
 - b. Special bonds, Special Guarantees, and Service Agreements.
 - c. Consent of Surety to Final Payment: As required in General Conditions.
 - d. Releases or Waivers of Liens and Claims: As required in General Conditions.
 - e. Releases from Agreements.
 - f. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01 29 00, Payment Procedures.
 - g. Extra Materials: As required by individual Specification sections.

1.02 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
2. Accuracy of Records:
 - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
 - b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.
4. Prior to submitting each request for progress payment, request Engineer's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Engineer to recommend whole or any part of Contractor's Application for Payment, either partial or final.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event Contractor is unable to secure written releases:
 - 1. Inform Owner of the reasons.
 - 2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
 - 3. Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
 - 4. When Owner is satisfied that the Work has been completed in agreement with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Contractor has failed to fulfill terms of side agreement or special easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

- A. General:
 - 1. Promptly following commencement of Contract Times, secure from Engineer at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
 - 2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
 - 3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by Engineer.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
 - a. Color Coding:
 - 1) Green when showing information deleted from Drawings.
 - 2) Red when showing information added to Drawings.
 - 3) Blue and circled in blue to show notes.
2. Date entries.
3. Call attention to entry by “cloud” drawn around area or areas affected.
4. Legibly mark to record actual changes made during construction, including, but not limited to:
 - a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
 - b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineer’s written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
 - a. Clearly identify the item by accurate note such as “cast iron drain,” “galv. water,” and the like.
 - b. Show, by symbol or note, vertical location of item (“under slab,” “in ceiling plenum,” “exposed,” and the like).
 - c. Make identification so descriptive that it may be related reliably to Specifications.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

3.02 FINAL CLEANING

- A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.
 - 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Engineer.
 - 2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
 - 3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
 - 4. Decontaminate sidewalks, loading areas, and others contiguous with principal structures.
 - 5. Rake clean all other surfaces.
 - 6. Remove snow and ice from access to buildings.
 - 7. Leave water courses, gutters, and ditches open and clean.
- B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

END OF SECTION

**SECTION 02 24 00
DELINEATION OF WETLANDS AND
OTHER WATERS OF THE UNITED STATES**

PART 1 GENERAL

1.01 SUMMARY

- A. This section describes work necessary to delineate wetlands across the Facility Area (FA) and prepare a recommendation for a US Army Corps of Engineers (USACE) Jurisdictional Determination of whether the wetlands are regulated under the Clean Water Act (CWA) Section 404. The work is to be performed following the protocol and methods in the *USACE Wetlands Delineation Manual Wetlands Research Program Technical Report Y-87-1 (1987 Manual)*, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*, the *USACE Jurisdictional Determination Form Instructional Guidebook, May 30, 2007 (JD Guidebook)* and any USACE St. Louis District requirements. The work also includes an optional task for preparation of a Substantive Requirements Document (SRD) for compliance with USACE Nationwide Permit 38 Cleanup of Toxic and Hazardous Waste.

1.02 DRAWINGS

- A. US Fish and Wildlife Service National Wetlands Inventory (NWI) of mapped wetlands for the site is included as Attachment A. Note that additional wetlands may appear on the NWI mapping depending on the scale. NWI is not designed for and is not suitable for making a CWA 404 delineation and determinations; a field delineation and site-specific recommendations about the field results is required.
- B. The survey is to be performed within the entire boundary of the FA.

1.03 DEFINITIONS

- A. Wetland: The USACE (Federal Register 1982) and the EPA (Federal Register 1980) jointly define wetlands as: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Except in certain situations defined in the *1987 Manual*, evidence of a minimum of one positive wetland indicator from each parameter (hydrology, soil, and vegetation) must be found in order to make a positive wetland determination.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

1. Diagnostic Environmental Characteristics. Wetlands have the following general diagnostic environmental characteristics:
 - a. Vegetation: The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions described in a above. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. Indicators of vegetation associated with wetlands are listed in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*.
 - b. Soil: Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions. Indicators of soils developed under reducing conditions are listed in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0, as supplemented by the Field Indicators of Hydric Soils, version 8.1, available at <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/>)*.
 - c. Hydrology: The area is inundated either permanently or periodically at mean water depths less than or equal to 6.6 ft, or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation. Indicators of hydrologic conditions that occur in wetlands are listed in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*.

1.04 ACTION SUBMITTALS

- A. Work Plan Submittal: In the Work Plan described in Section 01 11 00, Summary of Work, include a description of the approach to the wetland delineation, a map showing the areas to be included in the field survey, and a schedule for performing the delineation and associated reports.
- B. Technical Report of Wetlands Survey:
 1. Describe the delineation methodology and results of the delineation including USACE field data sheets, mapping developed from GPS data collection, and completion of all forms in the referenced guidance
 2. Representative Photos, labeled.
 3. Electronic GIS shape files, to include boundaries of each feature and paired wetland/upland boundary points for each feature (depending on size and shape, some features may require multiple paired points).

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

4. Jurisdictional Determination Form: Jurisdictional Determination Form per the referenced guidance, including a recommendation, and at a minimum, Background Information, Summary of Findings, CWA Analysis, and Data Sources.
- C. NWP 38 Substantive Requirements Document (if regulated wetlands will be disturbed): Contractor will prepare a Substantive Requirements Document documenting how the remediation project will address each requirement in NWP 38 Cleanup of Toxic and Hazardous Waste.

1.05 SEQUENCING AND SCHEDULING

- A. Refer to Section 01 31 13, Project Coordination, for specific milestone dates and sequencing and scheduling constraints.

PART 2 PRODUCTS

2.01 HIGH VISIBILITY FLAGS

- A. All delineations will include high-visibility flags, sequentially numbered for each identified feature with a unique alphanumeric indicating the feature on each flag followed by the sequence from 1 to the final flag for the feature. The final flag for each feature also will include the word “END”.

PART 3 EXECUTION

3.01 GENERAL

- A. Field to survey to identify and delineate potential wetlands, waters, and other regulated areas. The work is to be performed following the protocols and methods in the *USACE Wetlands Delineation Manual Wetlands Research Program Technical Report Y-87-1 (1987 Manual)* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)*.
- B. Record the location of wetlands, waters, and other regulated areas using a handheld GPS unit with sub-meter accuracy. Record pertinent wetland and waters data and take representative photographs of environmental resources identified. Note any observed connections with potential underground water conduits such as drainage pipes.
- C. Collect data needed to prepare a recommendation for a US Army Corps of Engineers (USACE) Jurisdictional Determination of whether the wetlands are regulated under the Clean Water Act (CWA) Section 404. The work is to be performed following the protocol and methods in the *USACE Jurisdictional Determination Form Instructional Guidebook, May 30, 2007 (JD Guidebook)* and any USACE St. Louis District requirements.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

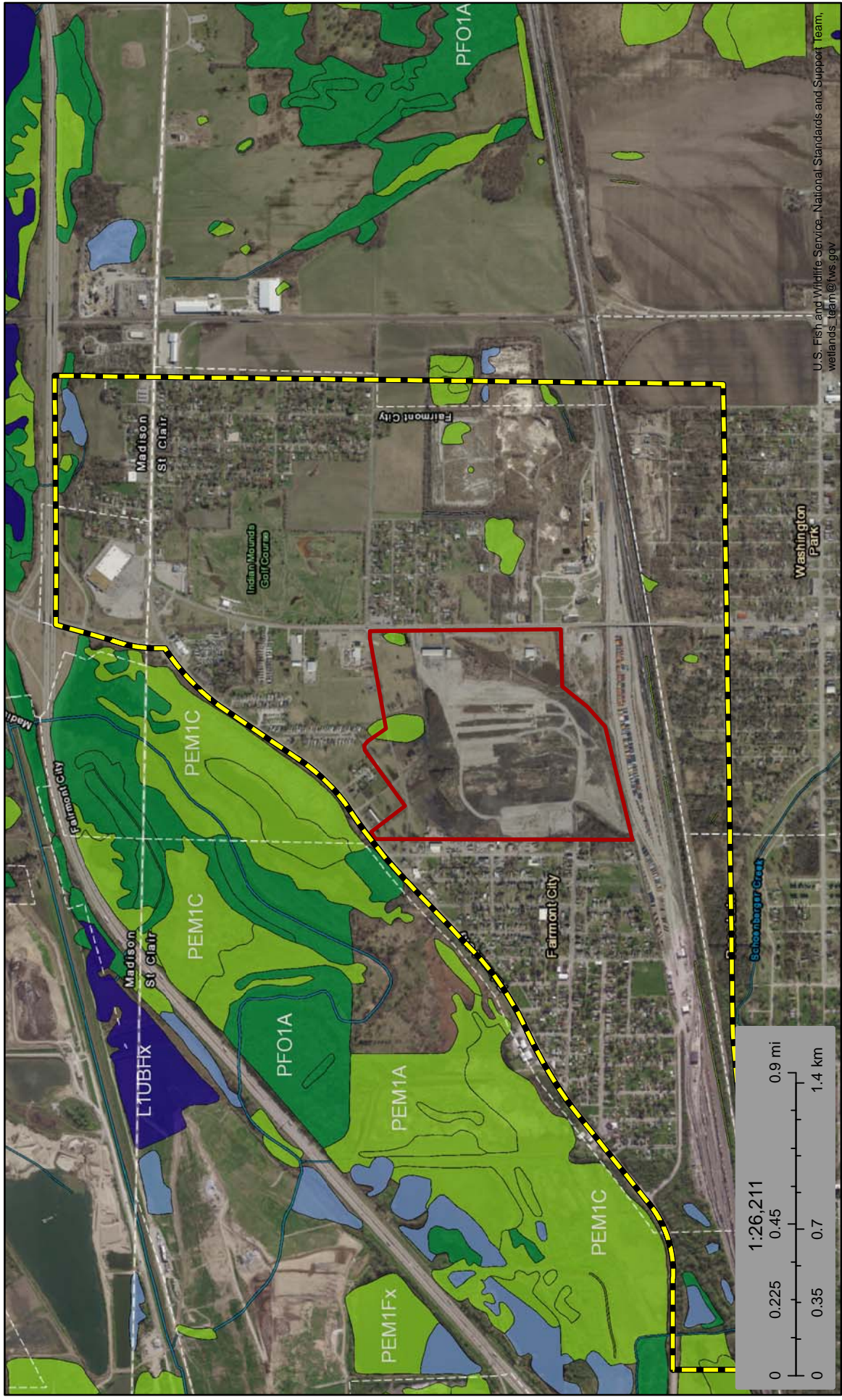
3.02 LIMITS

- A. Refer to Attachment Property Boundary and National Wetlands Inventory Map.

3.03 SUPPLEMENTS

- A. Attachment A – Property Boundary and National Wetlands Inventory Map.

END OF SECTION



June 7, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

- Facility Area Boundary
- Surrounding Properties Boundary (Approximate)

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

**SECTION 31 10 00
SITE CLEARING**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.
- B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.
- C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 6 inches below subgrade.
- D. Scalping: Removal of sod without removing more than upper 3 inches of topsoil.
- E. Stripping: Removal of topsoil remaining after applicable scalping is completed.
- F. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.02 SUBMITTALS

- A. Action Submittals: Drawings clearly showing clearing, grubbing, and stripping limits.

1.03 QUALITY ASSURANCE

- A. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits, prior to commencing clearing, grubbing, and stripping.

1.04 SCHEDULING AND SEQUENCING

- A. Prepare Site only after adequate erosion and sediment controls are in place. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls to maximum of 5 acres.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Clear, grub, and strip entire site within limits shown or specified.
- B. Do not injure or deface vegetation that is not designated for removal.
- C. Clearing, grubbing, and removal of any vegetation, trees, or structures that may provide migratory bird habitat will be performed between September 11 and March 31 (outside of the migratory bird nesting season), over the entirety of the FA. If tree clearing cannot be completed within that time frame, the Migratory Bird Field Assessment and Nest Clearing Protocol in Supplement A will be completed. For consistency with USFWS guidelines for protecting the endangered Indiana bat, removal of mature trees greater than 4-inch diameter will be further restricted during April 1 through September 30. If mature tree removal cannot be conducted outside that timeframe, potential roost trees will be visually assessed. If no bats are observed, clearing can commence. If bats are observed, tree removal will be postponed until after October 1, to the extent practicable.

3.02 LIMITS

- A. Project limits are shown on the Contract Drawings.
- B. Remove rubbish, trash, and junk from entire area within Project limits.

3.03 CLEARING

- A. Clear areas within limits shown or specified.
- B. Fell trees so that they fall away from facilities and vegetation not designated for removal.
- C. Cut stumps not designated for grubbing to within 6 inches of ground surface.
- D. Cut off shrubs, brush, weeds, and grasses to within 2 inches of ground surface.

3.04 GRUBBING

- A. Grub areas within limits shown or specified.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

3.05 SCALPING

- A. Do not remove sod until after clearing and grubbing is completed and resulting debris is removed.
- B. Scalp areas within limits shown or specified.

3.06 STRIPPING

- A. Do not remove topsoil until after scalping is completed.
- B. Strip areas within limits to minimum depths shown or specified. Do not remove subsoil with topsoil.
- C. Stockpile strippings, meeting requirements of Section 32 91 13, Soil Preparation, for topsoil, separately from other excavated material.

3.07 DISPOSAL

- A. Clearing and Grubbing Debris:
 - 1. Dispose of debris offsite.
 - 2. Burning of debris onsite will not be allowed.
 - 3. Woody debris may be chipped. Chips may be sold to Contractor's benefit or used for landscaping onsite as mulch or uniformly mixed with topsoil, provided that resulting mix will be fertile and not support combustion. Maximum dimensions of chipped material used onsite shall be 1/4 inch by 2 inches. Dispose of chips that are unsaleable or unsuitable for landscaping or other uses with unchipped debris.
 - 4. Root balls of trees shall be chipped and/or pulverized and disposed of in the Consolidation Area.
- B. Scalpings: As specified for clearing and grubbing debris.
- C. Strippings:
 - 1. Dispose of strippings that are unsuitable for topsoil or that exceed quantity required for topsoil offsite.
 - 2. Stockpile topsoil in sufficient quantity to meet Project needs. Dispose of excess strippings as specified for clearing and grubbing.

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

3.08 SUPPLEMENTS

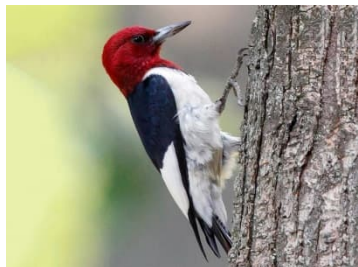
- A. The supplements listed below, following “End of Section”, are part of this specification.
1. Construction Environmental Checklist: Pre-Work Migratory Bird Field Assessment.
 2. Old American Zinc Superfund Site Nest Clearing Protocol.

END OF SECTION

Construction Environmental Checklist

Pre-Work Migratory Bird Field Assessment

Old American Zinc



Date of Assessment:

Site:

It is illegal to violate the Migratory Bird Treaty Act, which is fully prosecutable with civil and criminal penalties.

Name of Person Conducting Assessment:	Company Name:	Time of Assessment:
Section of Property Being Assessed:	Area Marked on Figure? YES No	Planned Construction Activity:
Description of Vegetation Present:	Is vegetation to be removed? Yes or No	Is vegetation marked on construction documents? Y/N

The following checklist is to help the project protect migratory birds by surveying the area prior to beginning any construction, land clearing or vegetation removal work between **April 1 to September 10** of each year for most species and varies by location (note bald eagles may nest year-round). Walk all areas prior to land disturbing activities, to identify whether any birds flush from the ground or trees when approached. If a bird flushes, look for a nest in that vicinity.

Live Species Observed?		# of Individuals Observed	Is it breeding here?		Behavior Observed	Habitat and Notes
Yes	No		Yes	No		

If a nest is present and not active (i.e., no eggs, no chicks, no adult birds, etc.), the nest may be removed as long as it will not result in the accidental death or injuring of a migratory bird or eggs. Nest removal helps to prevent migratory birds from nesting or returning to the area.

Nests Present?		Nest Location					Is Nest Active?		If No, has Nest been Removed?	
Yes	No	Tree	Shrub	Ground	Utility Pole	Other (specify)	Yes	No	Yes	No

If an active nest is present, the nest must be protected until the chicks fledge the nest (duration is dependent upon the species) *If found on-site, do not approach or harass the bird. Immediately call the Owner's Representative and establish a no-entry zone around the bird nest.*

Circle all the Protection Measures Implemented		
Work Activity Delayed	Area Marked and Roped Off	Fencing/Barrier installed
Vegetative Buffer Maintained	Field Disturbance in Area Minimized	Buffer Zone Established

Additional measures or actions taken: _____

Comments/Findings: _____

If active bird nests are in or near the construction site, the following specific situations are those most likely to be encountered during construction

- Blown-down nest (after storm events): if the nest is relatively undamaged and the young birds or eggs are unharmed, replace the nest into the tree/shrub from which it fell or in a nearby tree/shrub. The parents should continue to attend to the nest. A badly damaged nest may be replaced into a strawberry basket or other appropriately sized basket before placement in a tree/shrub. Note: it is a common fallacy that birds reject their young if they have acquired a human scent. However, excessive handling should be avoided none-the-less.
- Grounded Baby Birds: Frequently, birds seen hopping on the ground begging for food do not require your assistance. It is common for birds to fledge from the nest before they are fully feathered or flight-ready. They will be fed on the ground for a day or two until they are able to fly, and then may fly with a parent until able to forage on their own. Usually, if the grounded bird is a healthy fledgling, you will see the parent attending it or foraging nearby. Careful observation should help you make a correct determination. If the bird is in the road, place it under a nearby bush. Never unnecessarily handle or move the fledgling from the area where it was found. Baby blue jays are slow to mature, so the fledgling stage will generally take longer for them.

If the bird is tiny and not feathered, it is likely a 'nestling' that has fallen from its nest. If you can find the nest, put the nestling in the nest and avoid the area. If you cannot find the nest, line a small box with tissue and suspend from a branch or put it on the ground near where its nest is believed to be located and avoid the area.

If injured wildlife or bird is found, call the Owner's Representative. Also call the West-Central Region 4 Illinois Department of Natural Resources District Wildlife Biologist Carl Handel (618) 295-2877. For all bird injuries or deaths during construction, contact the USFWS Marion field office at 618-997-3344, ext. 345.

Draw a figure to identify area assessed and location of Any Active Nests

FACILITY AREA REMEDIAL DESIGN
OLD AMERICAN ZINC PLANT SUPERFUND SITE

Old American Zinc Superfund Site
Nest Clearing Protocol

The specifications will require that the construction manager retain a biologist with competency in migratory bird identification if trees or shrubs are being removed between April 1 and September 10. The following protocol and checklist will be in the project specifications:

Shrubs/Small Trees to be Removed by Excavator

1. Approach and note if any birds leave the shrub/tree.
2. Examine the shrub/tree to determine if there are any nests present on branches or ground.
3. If a nest is present and has eggs or live young birds in it, take a photo without disturbing the nest, and call the Owner's Representative who will consult with a biologist. Do not remove the nest or birds until directed by appropriate Owner Representative's supervision.
4. If no nest is present or one is present and no eggs or live birds are in it then proceed to remove the shrub/tree.

Large Tree to be Removed by Cutting

1. Approach and note if any birds leave the tree.
2. Move into first position for cutting and determine if there are any nests or cavities present .
3. If a nest or cavity is present, listen to determine if any live birds can be detected.
4. Take a picture of the nest and send it with any related field notes to the Project construction manager. Then attempt to visually determine if live mature or young birds or eggs are present. Use the nest guide to determine the type of bird
5. Call the Owner's Representative. Do not remove the nest, eggs, or birds until directed by appropriate Owner Representative's supervision.
6. If no nest or cavity is present or if no live birds are present then proceed to trim in that area as prescribed.

Move to the next cutting position and repeat the steps.

If ANY nests with live unfledged birds are identified during cutting or vegetation removal, stop work at that area and call the Owner's Representative. Work may proceed in other areas that have no eggs or live unfledged birds present.

SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
 - b. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - c. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

- A. Optimum Moisture Content: As defined in Section 31 23 23, Fill and Backfill.
- B. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and scarification and compaction of subgrade.
- C. Relative Compaction: As defined in Section 31 23 23, Fill and Backfill.
- D. Relative Density: As defined in Section 31 23 23, Fill and Backfill.
- E. Subgrade: Layer of existing soil after completion of clearing, grubbing, scalping of topsoil prior to placement of fill, roadway structure or base for floor slab.
- F. Proof-Rolling: Testing of subgrade by compactive effort to identify areas that will not support the future loading without excessive settlement.

1.03 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Sections 02 41 00, Demolition; 31 10 00, Site Clearing; and 31 23 16, Excavation, prior to subgrade preparation.

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- B. Contractor must complete the cone penetration test (CPT) survey grid prior to subgrade approval.
 - 1. CPT survey grid and coordinates are shown in the contract drawings.
 - 2. CPT logs and results shall be provided to Owner's Representative for approval.

1.04 QUALITY ASSURANCE

- A. Notify Engineer when subgrade is ready for compaction or proof-rolling or whenever compaction or proof-rolling is resumed after a period of extended inactivity.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Prepare subgrade when unfrozen and free of ice and snow.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Keep subgrade free of water, debris, and foreign matter during compaction or proof-rolling.
- B. Bring subgrade to proper grade and cross-section and uniformly compact surface.
- C. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.
- D. Maintain prepared ground surface in finished condition until next course is placed.

3.02 COMPACTION

- A. Under General Site Fill: Two passes with a three-wheeled power roller weighing approximately 10 tons.
- B. Within Consolidation Area: Compact upper 6 inches to minimum of 98 percent relative compaction as determined in accordance with ASTM D698.

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3.03 MOISTURE CONDITIONING

- A. Dry Subgrade: Add water, then mix to make moisture content uniform throughout.
- B. Wet Subgrade: Aerate material by blading, discing, harrowing, or other methods, to hasten drying process.

3.04 TESTING

- A. Proof-roll subgrade with equipment specified in Article Compaction to detect soft or loose subgrade or unsuitable material, as determined by Engineer.
- B. Nuclear methods (ASTM D6938) shall be used to verify compaction in consolidation area.

3.05 CORRECTION

- A. Soft or Loose Subgrade:
 - 1. Adjust moisture content and recompact, or
 - 2. Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.
- B. Unsuitable Material: Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.

END OF SECTION

**SECTION 31 23 16
EXCAVATION**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Common Excavation: Removal of material not classified as rock excavation.
- B. Influence Zone of a Structure or Pavement to be Protected: Bounded by a line extending 10 feet horizontally from existing grade at the outer edge of the structure or pavement, and then extending downward at a slope of 2H:1V away from the structure or pavement.

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Excavation Plan, Detailing:
 - a. Methods and sequencing of excavation.
 - b. Proposed locations of stockpiled excavated material.
 - c. Proposed onsite and offsite spoil disposal sites.
 - d. Numbers, types, and sizes of equipment proposed to perform excavations.
 - e. Anticipated difficulties and proposed resolutions.
 - f. Reclamation of onsite spoil disposal areas.
 - g. Provide methods and design for Temporary Excavation Support Systems where excavations are required with the Influence Zone of any structure or pavement to be protected, as defined in paragraph 1.01.
 - h. The excavation plan shall be prepared and sealed by the Contractor's professional engineer licensed in the State of Illinois.

1.03 QUALITY ASSURANCE

- A. Provide adequate survey control to avoid unauthorized over-excavation.

1.04 WEATHER LIMITATIONS

- A. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

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- B. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.05 SEQUENCING AND SCHEDULING

- A. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 31 10 00, Site Clearing, prior to excavating.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum.
- B. Over-excavation of slag is permitted if slag is present below the lines and grades shown on the Drawings.
 - 1. Contractor shall notify Engineer if slag is present below lines and grades shown.
 - 2. Over-excavation of slag shall occur until all visual evidence of slag is removed.
- C. If unidentified archaeological deposits are uncovered during excavation, protocol will be implemented as outlined in the Unanticipated Discovery Plan (UDP) (Appendix H of Basis of Design Report) to protect archaeological and cultural resources.

3.02 SLAG/RESIDUALS EXCAVATION

- A. Excavation of slag shall be completed, regardless of the type, nature, or condition of the materials encountered until visual evidence of contamination is gone.
 - 1. Engineer shall be notified if slag is present below lines and grades shown on the Drawings.

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- B. Remove concrete foundations and obstructions as encountered during excavation over the entire Facility Area.
 - 1. Foundations shall be removed completely, even below designed excavation depth.
 - 2. A concrete pulverizer shall be used to pulverize concrete into manageable sized pieces prior to stockpiling.
- C. Tarry material may be present mixed with demolition debris in localized areas across the footprints of former smelter buildings. Tarry materials were previously tested and found to be non-hazardous, therefore such material will be disposed of in the consolidation area.
- D. Install Temporary Excavation Support Systems per the Excavation Plan.

3.03 COMMON EXCAVATION

- A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.
- B. Material excavated shall be visually free of slag contamination.
- C. Material shall be placed in stockpiles on site to be used either as general site fill or low-permeability cover material.

3.04 STOCKPILING EXCAVATED MATERIAL

- A. Stockpile excavated material until material is needed:
 - 1. Slag and pulverized concrete foundations shall be placed on or adjacent to the existing slag stockpile on the northern portion of the site.
 - 2. Unimpacted excavated material shall be stockpiled either in general fill stockpile or clay stockpile as shown on the Drawings.
 - a. Clay stockpile material shall be used for the low-permeability cover system. Only clay meeting the performance requirements shall be stockpiled in this area.
 - b. General fill stockpile material shall be used for general site fill and may consist of clay or other materials as discussed in Section 31 23 23, Fill and Backfill.
- B. Post signs indicating proposed use of material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable by equipment operators from their normal seated position.
- C. Confine stockpiles to areas shown on the Drawings. Do not obstruct roads or streets.

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- D. Do not stockpile excavated material adjacent to trenches and other excavations, unless excavation side slopes and excavation support systems are designed, constructed, and maintained for stockpile loads.
- E. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.

3.05 DISPOSAL OF CONSOLIDATION MATERIAL

- A. Dispose of excavated materials, which are unsuitable or not needed for fill or backfill, in the consolidation area, as specified in Section 31 23 23 Fill and Backfill.
- B. Dispose of debris resulting from removal of concrete foundations within the consolidation area, as specified in Section 31 23 23 Fill and Backfill.
- C. Dispose of tarry material: Nonhazardous tarry materials shall be placed in the consolidation area with slag and pulverized concrete, as specified in Section 31 23 23 Fill and Backfill.
- D. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk as specified in Section 31 10 00, Site Clearing, for clearing and grubbing debris.

END OF SECTION

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**SECTION 31 23 23
FILL AND BACKFILL**

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
 - b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - c. D75, Standard Practice for Sampling Aggregates.
 - d. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - e. D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - f. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - g. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - h. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - i. D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - j. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
2. Illinois Environmental Protection Agency:
 - a. Illinois Administrative Code (IAC) Title 35, Part 742, Tiered Approach to Corrective Action Residential Criteria, Appendix B, Table A.
 - b. IAC Title 35, Part 1100 Illinois Clean Fill Regulations.
3. Illinois Department of Transportation (IDOT): Manual of Test Procedures for Materials, Illinois Test Procedure 11, Materials Finer than No. 75 μ m, (No. 200) Sieve in Mineral Aggregates by Washing.

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1.02 DEFINITIONS

- A. Relative Compaction:
 - 1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698.
 - 2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Engineer.
- B. Optimum Moisture Content:
 - 1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
 - 2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.
- C. Relative Density: Calculated in accordance with ASTM D4254 based on maximum index density determined in accordance with ASTM D4253 and minimum index density determined in accordance with ASTM D4254.
- D. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.
- E. Completed Course: A course or layer that is ready for next layer or next phase of Work.
- F. Lift: Loose (uncompacted) layer of material.
- G. Well-Graded:
 - 1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
 - 2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
 - 3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.
- H. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.
- I. Selected Backfill Material: Materials available onsite that Engineer determines to be suitable for specific use.
- J. Imported Material: Materials obtained from sources offsite, suitable for specified use.

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1.03 SUBMITTALS

A. Action Submittals:

1. A table describing borrow sources and a site drawing will be submitted identifying location(s) of borrow areas, and of any samples with respect to the specific borrow area at the borrow source. This will be provided by the Contractor within 5 days from Notice of Award. Owner or Owner's Representative will review and approve the selected borrow source and all analytical results prior to import of backfill and/or topsoil to the site.
2. Samples: Imported material taken at source.

B. Wetlands restoration plan, if required upon completion of work in Section 02 24 00, Delineation of Wetlands and Other Waters of the United States.

C. Informational Submittals:

1. Manufacturer's data sheets for compaction equipment.
2. Certified test results from independent testing agency.

1.04 QUALITY ASSURANCE

A. Notify Engineer when:

1. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
2. Fill material appears to be deviating from Specifications.

1.05 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Section 31 10 00, Site Clearing; Section 31 23 16, Excavation; and Section 31 23 13, Subgrade Preparation, prior to placing fill or backfill.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Gradation Tests:

1. In accordance with ASTM C136 and C117.
2. As necessary to locate acceptable sources of imported material and verify excavated material.

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3. During excavation or production of imported material, test as follows:
 - a. Clay Cover: every 1,500 tons.
 - b. General Site Fill: every 7,500 tons.
 - c. Topsoil: every 7,500 tons.
- B. Atterberg Limits Tests:
 1. In accordance with ASTM D4318.
 2. As necessary to locate acceptable sources of imported material and verify excavated material.
 3. During excavation or production of imported material, test as follows:
 - a. Clay Cover: every 1,500 tons.
 - b. General Site Fill: every 7,500 tons.
 - c. Topsoil: every 7,500 tons.
 4. Minimum Plasticity Index (PI) of 15.
- C. Proctor Tests:
 1. In accordance with ASTM D698.
 2. As necessary to locate acceptable sources of imported material and verify excavated material.
 3. During excavation or production of imported material, test as follows:
 - a. Clay Cover: every 1,500 tons.
 - b. General Site Fill: every 7,500 tons.
- D. Samples:
 1. Collected in accordance with ASTM D75.
 2. During excavation or production of imported material, provide Samples as follows:
 - a. Clay Cover: Every 1,500 tons.
 - b. General Site Fill: Every 7,500 tons.
 - c. Topsoil: Every 7,500 tons.
 3. Clearly mark to show source of material and intended use.
- E. Source quality control samples will be collected for the analyses listed in this section. If backfill materials are from different borrows or areas, separate samples will be collected and tested for each at the specified frequencies.
- F. Contractor will coordinate with Owner's Representative when identifying new borrow source(s) for imported materials to be used for backfill to ensure that compliance samples collected from the borrow source at a frequency of one sample per 1,000 cubic yards are representative of materials transported to the site. Compliance samples will be collected by the Owner's Representative with Contractor assistance.

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- G. The Owner's Representative will submit the compliance samples to the laboratory for testing for the following analyses:
 - 1. Chemical analyses: target compound list (TCL) organics (volatile organic compounds [VOCs] and semi-volatile organic compounds [SVOCs]), TCL pesticides, TCL polychlorinated biphenyls (PCBs), herbicides, and target analyze list (TAL) metals.
- H. Fertility and salinity will also be analyzed for topsoil samples.
- I. The materials must meet the Illinois Clean Fill operations criteria (35 IAC 1100) for the lowest of any of the exposure routes, regardless of where the fill is being placed onsite.

2.02 CONSOLIDATION MATERIAL

- A. Material intended for the consolidation area:
 - 1. Slag and affected soil.
 - 2. Excavated material from off-site residential properties consisting of soil potentially mixed with slag.
 - 3. Excavated material encountered on-site including, but not limited to, concrete, building demolition debris, impacted sediments and soils, and smelter materials.
- B. The Contractor is responsible for placement of all consolidation material into the consolidation area, including offsite material from surrounding properties.

2.03 CLAY COVER MATERIAL

- A. On-site material naturally occurring below slag and excavated from the footprint of the consolidation area.
- B. Conforming to the following properties:
 - 1. Soil material consisting of generally clay soils with an USCS classification (ASTM D2487) of CL, CH or otherwise approved by the Owner or Owner's Representative.
 - 2. Maximum particle size of 1-1/2 inches. Minimum of 20 percent passing the No. 200 sieve, by weight.
- C. The Contractor shall be responsible for:
 - 1. Determining if excavated material meets the specifications for clay cover material.
 - 2. Based on these results, deciding which stockpile excavated material shall be placed in.

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2.04 CONTRACTOR FURNISHED BORROW:

Prior to bringing commercially obtained borrow material onsite, the Contractor shall submit to the Contracting Officer for approval, the following information:

- A. Written evidence of property rights – Signed Agreement.
- B. Soil tests from a USACE validated laboratory.
- C. State Department of Natural Resources land disturbance permits and any other required state or local approvals.
- D. Clean Water Act 401 and 404 permits, if applicable.
- E. USDA Farmland Protection and Farmland Conversion Impact.
- F. Cultural Resource Assessment done by professional qualified archeologist; Section 106 Review and comments by state DNR.
- G. Endangered species report by independent Professional Biologist submitted to and commented on by both US Fish and Wildlife Service and USACE.
- H. Types and estimated quantities of materials to be obtained from each source.

2.05 GENERAL SITE FILL

- A. Soil material consisting of generally clay soils with an USCS classification of SC, CL, CL-ML, CH or as otherwise approved by the Owner or Owner's Representative.
- B. Free from rocks larger than 3 inches, from roots and other organic matter, ashes, cinders, trash, debris, and other deleterious materials.
- C. The Contractor shall be responsible for:
 - 1. Determining if excavated material meets the specifications for general site fill material.
 - 2. Based on these results, deciding which stockpile excavated material shall be placed in.

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2.06 TOPSOIL

- A. As specified in Section 32 91 13, Soil Preparation.

2.07 GRAVEL

- A. Free from clods, organic matter, or other deleterious material.
- B. Provide materials in accordance with current IDOT Standard Specifications for Road and Bridge Construction, gradation CA-6.
- C. Physical Qualities: Per Section 1004 of the IDOT Standard Specifications for Road and Bridge Construction.
- D. Gradation: Per 1004 of the IDOT Standard Specifications for Road and Bridge Construction.

2.08 WATER FOR MOISTURE CONDITIONING

- A. Free of hazardous or toxic contaminants, or contaminants deleterious to proper compaction.

PART 3 EXECUTION

3.01 GENERAL

- A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.
- B. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.
 - 1. A Test Section of the Consolidation Material will be performed to determine the appropriate compaction characteristics in preparation for mass filling as described below.
 - 2. Benching into adjacent lifts is permitted for the placement of the consolidation material and required for the clay cover.
- C. Do not place fill or backfill, if fill or backfill material is frozen, or if surface upon which fill or backfill is to be placed is frozen.

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- D. Do not place fill or backfill if material is wet, or surface upon which it is to be placed is wet. With Owner Representative's approval, sediment excavated from ditches to be placed within the consolidation area may be mixed with dry fill or backfill material to obtain an acceptable moisture content, as determined by the Owner's Representative, for placement into the consolidation area.
- E. Tolerances:
 - 1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
 - 2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.

3.02 FILL

- A. Consolidation Material:
 - 1. Test Section:
 - a. Test section shall consist of a single 200-foot by 200-foot section.
 - b. Material placed in test section shall conform to the gradations specified in ASTM D698.
 - c. Maximum 8-inch thick loose lifts.
 - 1) Consolidation material shall be broken into pieces such that it will fit within an 8-inch loose lift.
 - d. Place and compact across full width of test section
 - e. Compact to a minimum of 98 percent relative compaction as determined in accordance with ASTM D698, tested via ASTM D6938.
 - f. Completed test section shall be proof rolled and observed for rutting and/or pumping. The magnitude of the observed rutting/pumping will be used as a performance standard for the remainder of the fill.
 - 2. Remainder of Fill:
 - a. Place and compact across full width of consolidation area.
 - 1) Consolidation area will be filled in a grid system, with grid size not exceeding 200 feet by 200 feet.
 - 2) Benching, if needed, will be allowed for the consolidation material. Adjacent lifts may key into each other up to 2-feet, and at a thickness of 1/2 the lift thickness.
 - b. Compaction shall be performed via proof rolling:
 - 1) The same type of equipment used for the proof rolling of the Test Section shall be used for the remainder of the consolidation area fill.

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- 2) Compact to the performance standard set forth during the test section proof rolling.
- c. Dispose of concrete and demolition debris in the consolidation area. Bury a minimum of 2-feet below Clay Cover layer.

B. Clay Cover:

1. Maximum 6-inch thick lifts.
2. Place and compact across full width of cover.
3. Compact to minimum 98 percent relative compaction as determined in accordance with ASTM D698.
4. Compact at moisture content equal to or greater than the optimum moisture content determined in accordance with ASTM D698.
5. Compact using a sheepsfoot or padfoot roller compactor that substantially penetrates the depth of each lift.

C. General Site Fill:

1. Allow for 12-inch thickness of topsoil where required.
2. Maximum 12-inch thick lifts.
3. Compact to minimum 98 percent relative compaction as determined in accordance with ASTM D698.
4. Dress completed fill with allowance for topsoil, crest surfacing, and slope protection, where applicable.

3.03 SITE TESTING

A. Gradation, Atterberg Limits, and Proctor Tests:

1. One sample from each 1,500 tons of finished product or more often as determined by Engineer, if variation in gradation is occurring, or if material appears to depart from Specifications.
2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
3. Remove material placed in Work that does not meet Specification requirements.

B. In-Place Density Tests: In accordance with ASTM D6938. During placement of materials, test as follows:

1. Consolidation Material: In-Place Density Tests will only be performed on the test section, approximately five tests per 200-foot grid.
2. Clay Cover: One test per 100-foot grid, each lift.

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C. Proof Rolling:

1. Performed only on consolidation material after lifts have been completed and compacted.
2. Performance criteria for proof rolling will be established during the placement of the test section.
3. The same type of equipment used for the proof rolling of the test section shall be used for the remainder of the consolidation area fill.

3.04 REPLACING OVER-EXCAVATED MATERIAL/FILLING VOIDS

A. Replace excavation carried below grade lines shown or established by Engineer, or voids encountered during excavation as follows:

1. Beneath Fill or Backfill:
 - a. Same material as specified for overlying fill or backfill.
 - b. Compact as specified in paragraph 3.02.

3.05 RESTORATION

- A. The Contractor will restore wetlands and other waters of the United States, if required based on input from EPA and other regulatory agencies based on the results of the wetlands and other waters delineation that Contractor performs per Section 02 24 00, Delineation of Wetlands and Other Waters of the United States.

END OF SECTION

**SECTION 32 12 16
ASPHALT PAVING**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. M17, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
 - b. M81, Standard Specification for Cut-Back Asphalt (Rapid Curing Type).
 - c. M82, Standard Specification for Cut-Back Asphalt (Medium Curing Type).
 - d. M140, Standard Specification for Emulsified Asphalt.
 - e. M156, Standard Specification for Requirements for Mixing Plants for Hot-mixed, Hot-laid Bituminous Paving Mixes.
 - f. M208, Standard Specification for Cationic Emulsified Asphalt.
 - g. R35, Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt.
 - h. T166, Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Mixtures Using Saturated Surface-Dry Specimens.
 - i. T176 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.
 - j. T209, Standard Method of Test for Theoretical Maximum Specific Gravity (Gmm) and Density of Hot Mix Asphalt (HMA).
 - k. T245, Standard Method of Test for Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus.
 - l. T246, Standard Method of Test for Resistance to Deformation and Cohesion of Hot Mix Asphalt (HMA) by Means of Hveem Apparatus.
 - m. T247, Standard Method of Test for Preparation of Test Specimens of Hot Mix Asphalt (HMA) by Means of California Kneading Compactor.
 - n. T283, Standard Method of Test for Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage.
 - o. T304, Standard Method of Test for Uncompacted Void Content of Fine Aggregate.

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- p. T312, Standard Method of Test for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of a Superpave Gyratory Compactor.
- 2. Asphalt Institute (AI):
 - a. Manual Series No. 2 (MS-2), Mix Design Methods for Asphalt Concrete.
 - b. Superpave Series No. 2 (SP-2), Superpave Mix Design.
- 3. ASTM International (ASTM):
 - a. D75, Standard Method of Test for Sampling of Aggregates.
 - b. D140, Standard Method of Test for Sampling Bituminous Materials.
 - c. D979, Standard Method of Test for Sampling Bituminous Paving Mixtures.
 - d. D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
 - e. D2489, Standard Method of Test for Determining Degree of Particle Coating of Asphalt Mixtures.
 - f. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - g. D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
 - h. D5821, Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.
 - i. E329 REV A, Standard Specification for Agencies Engaged in Construction Inspection Testing, or Special Inspection.

1.02 DEFINITIONS

- A. Combined Aggregate: All mineral constituents of asphalt concrete mix, including mineral filler and separately sized aggregates.
- B. Maximum Aggregate Size: One sieve size larger than the nominal aggregate size.
- C. Nominal Aggregate Size: One sieve size larger than the first sieve that retains more than 10 percent aggregate.
- D. Prime Coat: Low viscosity cutback or emulsified asphalt applied to granular base in preparation of paving to coat and bond loose materials, harden the surface, plug voids, prevent moisture migration, and provide adhesion.
- E. Reclaimed asphalt pavement (RAP): Removed and/or processed pavement materials containing binder and aggregate.

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- F. Seal Coat: Term used for various applications of emulsified asphalt, with or without sand or aggregate, to protect the asphalt surface from aging due to wear, degradation from the sun, wind, and water. Also used to improve skid resistance and aesthetics. The term seal coat can be used to define fog seal, slurry seal, chip seal or sand seal, depending on application.
- G. Standard Specifications: Illinois Department of Standard Specifications for Road and Bridge Construction, latest edition.
- H. Tack Coat: Thin layer of emulsified asphalt applied to hard surfaces, including new pavement lifts, to promote adhesion and bonding.

1.03 SUBMITTALS

A. Informational Submittals:

- 1. Manufacturer's Certificate of Compliance for the following materials:
 - a. Aggregate: Gradation, source test results as defined in this section.
 - b. Asphalt for Binder: Type, grade, and viscosity-temperature curve.
 - c. Prime Coat: Type and grade of asphalt.
 - d. Tack Coat: Type and grade of asphalt.
 - e. Additives.
 - f. Mix: Conforms to job-mix formula.
- 2. Statement of qualification for independent testing laboratory.
- 3. Test Results:
 - a. Mix design.
 - b. Asphalt concrete core.
 - c. Gradation and asphalt content of uncompacted mix.

1.04 QUALITY ASSURANCE

A. Qualifications:

- 1. Independent Testing Laboratory: In accordance with ASTM E329 REV A.
- 2. Asphalt concrete mix formula shall be prepared by approved certified independent laboratory under the supervision of a certified asphalt technician.

B. Compaction Control Strip:

- 1. General:
 - a. Construct to approximately 400 square yards in area and at location that will become a portion of completed paved area.
 - b. Thickness: Typical of thickness to be paved on Project.

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2. Rollers Used for Compaction:
 - a. Steel Wheel Rollers: Minimum static weight 10 tons (9 mg).
 - b. Pneumatic Rollers: Capable of exerting pressure of 80 psi (550 kPa) on bituminous surface.
 - c. Vibratory Rollers: Static weight minimum 6 tons (5.5 mg), capable of applying a 10-ton (9-mg) impact force equipped with amplitude and frequency control specifically designed for compaction of bituminous mixtures.
3. Compaction:
 - a. Compact bituminous mat, using a standard rolling pattern that covers entire control strip. Request that Engineer performs final density test.
 - b. Continue rolling until no further compaction can be obtained as determined by field density testing.
 - c. Temperature and condition of bituminous mat shall be considered workable when further compaction can no longer be obtained.
4. Target Density Determination:
 - a. Select test point near center of normal roller pass, but no closer than 2 feet (600 millimeters) from edge of mat and 50 feet (15 meters) from either end of control strip. Mat thickness at this point shall be at least depth of finished pavement.
 - b. Point at which no further densification can be obtained.
5. Establish new target density if change is made in mix design, nominal depth of mat being placed, aggregate source, or material properties.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Temperature: Do not apply asphalt materials or place asphalt mixes when ground temperature is lower than 50 degrees F (10 degrees C) or air temperature is lower than 40 degrees F (4 degrees C). Measure ground and air temperature in shaded areas away from heat sources or wet surfaces.
- B. Moisture: Do not apply asphalt materials or place asphalt mixes when application surface is wet.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Prime Coat: Cutback asphalt, conform to Section 406 of the Standard Specifications.

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B. Tack Coat:

1. Emulsified Asphalt for Tack Coat or Seal Coat: Conform to Section 406 of the Standard Specifications.

C. Sand for Blotter Material or Sand Seal: Clean, dry, with 100 percent passing No. 4 (4.75-millimeter) sieve, and a maximum of 10 percent passing No. 200 (75 (m) sieve.

2.02 ASPHALT CONCRETE MIX

A. General:

1. Mix formula shall not be modified except with written approval of Engineer.
2. Source Changes:
 - a. Should material source(s) change, establish new asphalt concrete mix formula before new material(s) is used.
 - b. Perform check tests of properties of plant-mix bituminous materials on first day of production and as requested by Engineer to confirm that properties are in compliance with design criteria.
 - c. Make adjustments in gradation or asphalt content as necessary to meet design criteria.

B. Composition: Hot-plant mix of aggregate, mineral filler if required, and paving grade asphalt cement. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that resulting mixture meets grading requirements of mix formula.

C. Aggregate:

1. General: As specified in Section 406 of the Standard Specifications.

D. Mineral Filler: In accordance with AASHTO M17.

E. Asphalt Cement: Paving Grade as specified in Section 406 of the Standard Specifications.

PART 3 EXECUTION

3.01 GENERAL

A. Traffic Control:

1. In accordance with Section 01 50 00, Temporary Facilities and Controls.

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2. Minimize inconvenience to traffic, but keep vehicles off freshly treated or paved surfaces to avoid pickup and tracking of asphalt.
- B. Driveways: Repave driveways from which pavement was removed. Leave driveways in as good or better condition than before start of construction.

3.02 LINE AND GRADE

- A. Provide and maintain intermediate control of line and grade, independent of underlying base, to meet finish surface grades and minimum thickness.
- B. Shoulders: Construct to line, grade, and cross-section shown.

3.03 PREPARATION

- A. Prepare subgrade as specified in Section 301 of the Standard Specifications.
- B. Existing Roadway:
 1. Modify profile by grinding, milling, or overlay methods as approved, to provide meet lines and surfaces and to produce smooth riding connection to existing facility.
 2. Remove existing material to a minimum depth of 1 inch (25 millimeters).
 3. Paint edges of meet line with tack coat prior to placing new pavement.
- C. Thoroughly coat edges of contact surfaces (curbs, manhole frames) with emulsified asphalt or asphalt cement prior to laying new pavement. Prevent staining of adjacent surfaces.

3.04 PAVEMENT APPLICATION

- A. General: Place asphalt concrete mixture on approved, prepared base in conformance with this section.
- B. Prime Coat:
 1. Heat cutback asphalt, as specified in Section 406 of the Standard Specifications, prior to application.
 2. Apply uniformly to clean, dry surfaces avoiding overlapping of applications.
 3. Do not apply when moisture content of upper 3 inches (75 millimeters) of base exceeds optimum moisture content of base, or if free moisture is present.

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4. Application Rate: 0.15 gallon to 0.50 gallon per square yard (70 liters to 2.28 liters per square meter) of surface area.
5. Remove or redistribute excess material.
6. Allow a minimum of 5 full days for curing of primed surface before placing asphalt concrete.

C. Tack Coat:

1. Prepare material, as specified in Section 406 of the Standard Specifications, prior to application.
2. Apply uniformly to clean, dry surfaces avoiding overlapping of applications.
3. Do not apply more tack coat than necessary for the day's paving operation.
4. Touch up missed or lightly coated surfaces and remove excess material.
5. Application Rate: 0.05 gallon per square yard to 0.15 gallon per square yard (0.25 liter per square meter to 0.70 liter per square meter) of asphalt (residual if diluted emulsified asphalt).

D. Pavement Mix:

1. Prior to Paving:
 - a. Sweep primed surface free of dirt, dust, or other foreign matter.
 - b. Patch holes in primed surface with asphalt concrete pavement mix.
 - c. Blot excess prime material with sand.
2. Place asphalt concrete pavement mix in one single lift.
3. Compacted Lift Thickness:
 - a. Minimum: Twice maximum aggregate size, but in no case less than 1 inch (25 millimeters).
 - b. Maximum: 4 inches (100 millimeters).
4. Total Compacted Thickness: Match existing pavement.
5. Sequence placement so that meet lines are straight and edges are vertical.
6. Collect and dispose of segregated aggregate from raking process. Do not scatter material over finished surface.
7. Joints:
 - a. Offset edge of each layer a minimum of 6 inches (150 millimeters) so joints are not directly over those in underlying layer.
 - b. Offset longitudinal joints in roadway pavements so longitudinal joints in wearing layer coincide with pavement centerlines and lane divider lines.
 - c. Form transverse joints by cutting back on previous day's run to expose full vertical depth of layer.

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8. Succeeding Lifts: Apply tack coat to pavement surface between each lift.
 9. After placement of pavement, seal meet line by painting a minimum of 6 inches (150 millimeters) on each side of joint with cutback or emulsified asphalt. Cover immediately with sand.
- E. Compaction: Uniformly compact each course to target density arrived at in compaction control strip.
- F. Tolerances:
1. General: Conduct measurements for conformity with crown and grade immediately after initial compression. Correct variations immediately by removal or addition of materials and by continuous rolling.
 2. Completed Surface or Wearing Layer Smoothness:
 - a. Uniform texture, smooth, and uniform to crown and grade.
 - b. Maximum Deviation: 1/8 inch (3 millimeter) from lower edge of a 12-foot (3.6-meter) straightedge, measured continuously parallel and at right angle to centerline.
 - c. If surface of completed pavement deviates by more than twice specified tolerances, remove and replace wearing surface.
 3. Transverse Slope Maximum Deviation: (1/4 inch (6 millimeters) in 12 feet (3.6 meters) from rate of slope shown.
 4. Finished Grade:
 - a. Perform field differential level survey on maximum 50-foot (15-meter) grid and along grade breaks.
 - b. Maximum Deviation: 0.02 foot (6 millimeters) from grade shown.
- G. Seal Coat:
1. General: Apply seal coat of paving grade or emulsified asphalt to finished surface at longitudinal and transverse joints, joints at abutting pavements, areas where asphalt concrete was placed by hand, patched surfaces, and other areas as directed by Engineer.
 2. Preparation:
 - a. Surfaces that are to be sealed shall be maintained free of holes, dry, and clean of dust and loose material.
 - b. Seal in dry weather and when temperature is above 35 degrees F (2 degrees C).
 3. Application:
 - a. Fill cracks over 1/16 inch (1.5 millimeters) in width with asphalt-sand slurry or approved crack sealer prior to sealing.
 - b. When sealing patched surfaces and joints with existing pavements, extend minimum 6 inches (150 millimeters) beyond edges of patches.

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3.05 PAVEMENT OVERLAY

A. Preparation:

1. Remove fatty asphalt, grease drippings, dust, and other deleterious matter.
2. Surface Depressions: Fill with asphalt concrete mix, and thoroughly compact.
3. Damaged Areas: Remove broken or deteriorated asphalt concrete and patch as specified in Article Patching.
4. Portland Cement Concrete Joints: Remove joint filler to minimum 1/2 inch (12 millimeters) below surface.

B. Application:

1. Tack Coat: As specified in this section.
2. Place and compact asphalt concrete as specified in Article Pavement Application.
3. Place first layer to include widening of pavement and leveling of irregularities in surface of existing pavement.
4. When leveling irregular surfaces and raising low areas, the actual compacted thickness of any one lift shall not exceed 2 inches (50 millimeters).
5. Actual compacted thickness of intermittent areas of 120 square yards (100 square meters) or less may exceed 2 inches (50 millimeters), but not 4 inches (100 millimeters).
6. Final wearing layer shall be of uniform thickness, and meet grade and cross-section as shown.

3.06 PATCHING

A. Preparation:

1. Remove damaged, broken, or unsound asphalt concrete adjacent to patches. Trim to straight lines exposing smooth, sound, vertical edges.
2. Prepare patch subgrade as specified in Section 31 23 13, Subgrade Preparation.

B. Application:

1. Patch Thickness: 3 inches (75 millimeters) or thickness of adjacent asphalt concrete, whichever is greater.
2. Place asphalt concrete mix across full width of patch in layers of equal thickness.

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3. Spread and grade asphalt concrete with hand tools or mechanical spreader, depending on size of area to be patched.

C. Compaction:

1. Roll patches with power rollers capable of providing compression of 200 pounds per linear inch to 300 pounds per linear inch (350 Newtons per linear centimeter to 525 Newtons per linear centimeter). Use hand tampers where rolling is impractical.
2. Begin rolling top course at edges of patches, lapping adjacent asphalt surface at least one-half the roller width. Progress toward center of patch overlapping each preceding track by at least one-half width of roller.
3. Make sufficient passes over entire area to remove roller marks and to produce desired finished surface.

D. Tolerances:

1. Finished surface shall be flush with and match grade, slope, and crown of adjacent surface.
2. Tolerance: Surface smoothness shall not deviate more than plus 1/4 inch (6 millimeters) or minus 0 inch when straightedge is laid across patched area between edges of new pavement and surface of old surfacing.

3.07 FIELD QUALITY CONTROL

- A. General: Provide services of approved certified independent testing laboratory to conduct tests.

B. Field Density Tests:

1. Perform tests from cores or sawed samples in accordance with AASHTO T166.
2. Measure with properly operating and calibrated nuclear density gauge in accordance with ASTM D2950.
3. Maximum Density: In accordance with ASTM D2041, using sample of mix taken prior to compaction from same location as density test sample.

C. Testing Frequency:

1. Quality Control Tests:
 - a. Asphalt Content, Aggregate Gradation: Once per every 500 tons (400 mg) of mix or once every 4 hours, whichever is greater.

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- b. Mix Design Properties, Measured Maximum (Rice's) Specific Gravity: Once every 1,000 tons (900 mg) or once every 8 hours, whichever is greater.
- 2. Density Tests: Once every 500 tons (450 mg) of mix or once every 4 hours, whichever is greater.

END OF SECTION

**SECTION 32 91 13
SOIL PREPARATION**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. C33/C33M, Standard Specification for Concrete Aggregates.
 - b. C602, Standard Specification for Agricultural Liming Materials.
 - c. D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
 - d. D5268, Standard Specification for Topsoil Used for Landscaping Purposes.

1.02 SUBMITTALS

- A. Action Submittals:
 - 1. Samples: Representative of stockpiled or imported topsoil.
- B. Informational Submittals:
 - 1. Certified Topsoil Analysis Reports:
 - a. Indicate quantities of materials necessary to bring imported topsoil into compliance with textural/gradation requirements.
 - b. Indicate quantity of lime, quantity and analysis of fertilizer, and quantity and type of soil additive.

1.03 SEQUENCING AND SCHEDULING

- A. Perform Work specified in Section 31 10 00, Site Clearing, Section 31 23 16, Excavation, and Section 31 23 23, Fill and Backfill prior to performing Work specified under this section.

PART 2 PRODUCTS

2.01 TOPSOIL

- A. General: Natural, friable, sandy loam, obtained from well-drained areas, free from objects larger than 1-1/2 inches maximum dimension, and free of subsoil, roots, grass, other foreign matter, hazardous or toxic substances, and deleterious material that may be harmful to plant growth or may hinder grading, planting, or maintenance.

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- B. Composition: In general accordance with ASTM D5268:
 - 1. Gravel-Sized Fraction: Maximum 5 percent by weight retained on a No. 10 sieve.
 - 2. Sand-Sized Fraction: 20 to 60 percent passing No. 10 sieve.
 - 3. Silt and Clay-Sized Fraction: 35 to 70 percent.
- C. Organic Matter: Minimum 1.5 percent by dry weight as determined in accordance with ASTM D2974.
- D. pH: Range 6.5 to 7.5.
- E. Textural Amendments: Amend as necessary to conform to required composition by incorporating sand, peat, manure, or sawdust.
- F. Source: Import topsoil if onsite material is insufficient in quantity.

2.02 LIME

- A. Composition: Ground limestone with not less than 85 percent total carbonates, ASTM C602.
- B. Gradation:
 - 1. Minimum 50 percent passing No. 100 sieve.
 - 2. Minimum 90 percent passing No. 20 sieve.
 - 3. Coarser material acceptable provided rates of application are increased proportionately on basis of quantities passing No. 100 sieve.

2.03 SOIL ADDITIVES

- A. Sawdust or Ground Bark:
 - 1. Nontoxic, of uniform texture, and subject to slow decomposition when mixed with soil.
 - 2. Nitrogen-treated, or if untreated mix with minimum 0.15 pound of ammonium nitrate or 0.25 pound of ammonium sulfate per cubic foot of loose material.
- B. Peat:
 - 1. Composition: Natural residue formed by decomposition of reeds, sedges, or mosses in a freshwater environment, free from lumps, roots, and stones.
 - a. Organic Matter: Not less than 90 percent on a dry weight basis as determined by ASTM D2974.
 - b. Moisture Content: Maximum 65 percent by weight at time of delivery.

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C. Fertilizer:

1. Natural:
 - a. Manure:
 - 1) Well-rotted, stable or cattle manure, free from weed seed and refuse.
 - 2) Maximum 50 percent sawdust or shavings by volume.
 - 3) Age: Minimum 4 months; maximum 2 years.
2. Commercial:
 - a. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose.
 - b. Contain the following minimum percentage of plant food by weight:
 - 1) Summer Mix:
 - a) Nitrogen: 20 percent.
 - b) Phosphoric Acid: 10 percent.
 - c) Potash: 10 percent.
 - 2) Winter Mix:
 - a) Nitrogen: 16 percent.
 - b) Phosphoric Acid: 8 percent.
 - c) Potash: 0 percent.

D. Sand: Fine Aggregate: Clean, coarse, well-graded, ASTM C33/C33M.

2.04 SOURCE QUALITY CONTROL

- A. Topsoil Analysis/Testing: Performed by county or state soil testing service or approved certified independent testing laboratory.
- B. Source quality control samples will be collected at the frequency and for the analyses listed in Section 31 23 23, Fill and Backfill. If topsoil is from different borrows or areas, separate samples will be collected and tested for each at the specified frequencies.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Scarify subgrade to minimum depth of 6 inches where topsoil is to be placed.
- B. Remove stones over 2-1/2 inches in any dimension, sticks, roots, rubbish, and other extraneous material.
- C. Limit preparation to areas which will receive topsoil within 2 days after preparation.

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3.02 TOPSOIL PLACEMENT

- A. Do not place topsoil when subsoil or topsoil is frozen, excessively wet, or otherwise detrimental to the Work.
- B. Mix soil amendments, lime, and other soil additives, identified in analysis reports with topsoil before placement or spread on topsoil surface and mix thoroughly into entire depth of topsoil before planting or seeding. Delay mixing of fertilizer if planting or seeding will not occur within 3 days.
- C. Place topsoil to depth as shown where seeding and planting are scheduled.
- D. Uniformly distribute to within 1/2 inch of final grades. Fine grade topsoil eliminating rough or low areas and maintaining levels, profiles, and contours of subgrade.
- E. Remove stones exceeding 1-1/2-inch diameter, roots, sticks, debris, and foreign matter during and after topsoil placement.
- F. Remove surplus subsoil and topsoil from Site. Grade stockpile area as necessary and place in condition acceptable for planting or seeding.

END OF SECTION

**SECTION 32 92 00
TURF AND GRASSES**

PART 1 GENERAL

1.01 DEFINITIONS

- A. Maintenance Period: Begin maintenance immediately after each area is planted (seed, sod, or sprig) and continue for a period of 8 weeks after all planting under this section is completed.
- B. Satisfactory Stand: Grass or section of grass of 10,000 square feet or larger that has:
 - 1. No bare spots larger than 3 square feet.
 - 2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
 - 3. Not more than 15 percent of total area with bare spots larger than 6 square inches.

1.02 SUBMITTALS

- A. Action Submittals: Product labels/data sheets.
- B. Informational Submittals:
 - 1. Seed: Certification of seed analysis, germination rate, and inoculation:
 - a. Certify that each lot of seed has been tested by a testing laboratory certified in seed testing, within 6 months of date of delivery.
Include with certification:
 - 1) Name and address of laboratory.
 - 2) Date of test.
 - 3) Lot number for each seed specified.
 - 4) Test Results: (i) name, (ii) percentages of purity and of germination, and (iii) weed content for each kind of seed furnished.
 - b. Mixtures: Proportions of each kind of seed.
 - 2. Seed Inoculant Certification: Bacteria prepared specifically for legume species to be inoculated.
 - 3. Description of required maintenance activities and activity frequency.

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1.03 DELIVERY, STORAGE, AND PROTECTION

- A. Seed:
 - 1. Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.
 - 2. Keep dry during storage.
- B. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.04 WEATHER RESTRICTIONS

- A. Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.

1.05 SEQUENCING AND SCHEDULING

- A. Prepare topsoil as specified in Section 32 91 13, Soil Preparation, before starting Work of this section.
- B. Complete Work under this section within 3 days following completion of soil preparation.
- C. Notify Engineer at least 3 days in advance of:
 - 1. Each material delivery.
 - 2. Start of planting activity.
- D. Planting Season: Those times of year that are normal for such Work as determined by accepted local practice.

1.06 MAINTENANCE SERVICE

- A. Contractor: Perform maintenance operations during maintenance period to include:
 - 1. Watering: Keep surface moist.
 - 2. Washouts: Repair by filling with topsoil, liming, fertilizing, seeding, and mulching.
 - 3. Mulch: Replace wherever and whenever washed or blown away.
 - 4. Mowing: Mow to 2 inches after grass height reaches 3 inches, and mow to maintain grass height from exceeding 3-1/2 inches.
 - 5. Reseed unsatisfactory areas or portions thereof immediately at the end of the maintenance period if a satisfactory stand has not been produced.

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6. Reseed/replant during next planting season if scheduled end of maintenance period falls after September 15.
7. Reseed/replant entire area if satisfactory stand does not develop by July 1 of the following year.

PART 2 PRODUCTS

2.01 FERTILIZER

- A. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose. Minimum percentage of plant food by weight.
- B. Application Rates: Determined by soil analysis results.
- C. Mix:
 1. Nitrogen: 10 percent.
 2. Phosphoric Acid: 10 percent.
 3. Potash: 10 percent.
 4. Bonemeal: Commercial, raw, finely ground, with minimum analysis of 4 percent nitrogen and 20 percent phosphoric acid.
 5. Superphosphate: Soluble mixture of phosphate obtained from treated mineral phosphates with minimum analysis of 20 percent available phosphoric acid.
- D. Top Dress Type: As recommended by local authority.

2.02 SEED

- A. Fresh, clean new-crop seed that complies with the tolerance for purity and germination established by Official Seed Analysts of North America.
- B. Seeds of Legumes: Inoculated with pure culture of nitrogen-fixing bacteria prepared specifically for legume species in accordance with inoculant manufacturer's instructions.
- C. Seed Mix:
 1. General: shall conform to IDOT Class 4 Native Grass Mixture.
 2. Ditches: shall conform to IDOT Class 4B Wetland Grass and Sedge Mix.
 3. Winter Protective Seed: Annual ryegrass.

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2.03 STRAW MULCH

- A. Threshed straw of oats, wheat, barley, or rye, free from (i) seed of noxious weeds or (ii) clean salt hay.

2.04 HYDROSEEDING MULCH

A. Wood Cellulose Fiber Mulch:

- 1. Specially processed wood fiber containing no growth or germination inhibiting factors.
- 2. Dyed a suitable color to facilitate inspection of material placement.
- 3. Manufactured such that after addition and agitation in slurry tanks with water, the material fibers will become uniformly suspended to form homogenous slurry.
- 4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

2.05 NETTING

A. Jute:

- 1. Heavy-duty, twisted, weighing 1 pound per square yard.
- 2. Openings Between Strands: Approximately 1 inch square.

B. Matting:

- 1. Excelsior mat or straw blanket; staples as recommended by matting manufacturer.
- 2. Manufacturers and Products:
 - a. Akzo Industries, Ashville, NC; Curlex mat.
 - b. North American Green, Evansville, IN; S150 blanket.

2.06 TACKIFIER

A. Derived from natural organic plant sources containing no growth or germination-inhibiting materials.

- 1. Capable of hydrating in water, and to readily blend with other slurry materials.
- 2. Wood Cellulose Fiber: Add as tracer, at rate of 150 pounds per acre.
- 3. Manufacturers and Products:
 - a. Chevron Asphalt Co.; CSS 1.
 - b. Terra; Tack AR.
 - c. J Tack; Reclamare.

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2.07 WEED BARRIER

- A. 6 mils (0.006 inch) black polyethylene sheet.

PART 3 EXECUTION

3.01 PREPARATION

- A. Grade areas to smooth, even surface with loose, uniformly fine texture.
 - 1. Roll and rake, remove ridges, fill depressions to meet finish grades.
 - 2. Limit such Work to areas to be planted within immediate future.
 - 3. Remove debris, and stones larger than 1-1/2-inch diameter, and other objects that may interfere with planting and maintenance operations.
- B. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry off before seeding. Do not create muddy soil.
- C. Restore prepared areas to specified condition if eroded or otherwise disturbed after preparation and before planting.

3.02 FERTILIZER

- A. Apply evenly over area in accordance with manufacturer's instructions. Mix into top 2 inches of topsoil, when applied by broad cast method.
- B. Application Rate: 23 pounds per 1,000 square feet (1,000 pounds per acre).

3.03 SEEDING

- A. Start within 2 days of preparation completion.
- B. Hydroseed slopes steeper than 3H:1V. Flatter slopes may be mechanically seeded.
- C. Mechanical: Broadcast seed in two different directions, compact seeded area with cultipactor or roller.
 - 1. Sow seed at uniform rate of 50 pounds per acre.
 - 2. Use Brillion type seeder.
 - 3. Broadcasting will be allowed only in areas too small to use Brillion type seeder. Where seed is broadcast, increase seeding rate 20 percent.
 - 4. Roll with ring roller to cover seed, and water with fine spray.

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D. Hydroseeding:

1. Application Rate: 50 pounds per acre.
2. Apply on moist soil, only after free surface water has drained away.
3. Prevent drift and displacement of mixture into other areas.
4. Upon application, allow absorption and percolation of moisture into ground.
5. Mixtures: Seed and fertilizer may be mixed together, apply within 30 minutes of mixing to prevent fertilizer from burning seed.

E. Cover Crop Seeding: Apply seed at rate of 120 pounds per acre to areas that are bare or incomplete after September 15.

F. Mulching: Apply uniform cover of straw mulch at a rate of 2 tons per acre.

G. Netting: Immediately after mulching, place over mulched areas with slopes steeper than 3H:1V, in accordance with manufacturer's instructions. Locate strips parallel to slope and completely cover seeded areas.

H. Tackifier: Apply over mulched areas with slopes steeper than 4:1 at rate of 5 gallons per 1,000 square feet in accordance with the manufacturers recommended requirements.

I. Water: Apply with fine spray after mulching to saturate top 4 inches of soil.

3.04 FIELD QUALITY CONTROL

- A. 8 weeks after seeding is complete and on written notice from Contractor, Engineer will, within 15 days of receipt, determine if a satisfactory stand has been established.
- B. If a satisfactory stand has not been established, Contractor shall re-seed at their own expense. Once a satisfactory stand is established, the Contractor shall notify the Engineer.

3.05 PROTECTION

- A. Protect from pedestrian traffic by erecting temporary fence around each newly seeded area.

END OF SECTION

SECTION 33 01 30.16
TELEVISION INSPECTION OF SEWER PIPELINES

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. National Association of Sewer Service Companies (NASSCO): Pipeline Assessment Certification Program (PACP).
 2. Occupational Safety and Health Act (OSHA).

1.02 SUBMITTALS

- A. Action Submittals:
1. Catalog and manufacturer's data sheets for television equipment.
 2. Acceptance Standard closed-circuit television (CCTV) video; two copies.
- B. Informational Submittals:
1. References: Contact names and telephone numbers.
 2. List of staff and equipment to be used on Project.
 3. Crew chief qualifications.
 4. Crew chief contact information: name, mobile telephone number.
 5. Certification that staff to be used for the Work is properly trained in confined space entry and hazardous atmospheres.
 6. Training and inspection plan, 7 days prior to manual inspection.
 7. Traffic control plan.
 8. Confined space entry procedures.
 9. Schedule: 7-day look-ahead; weekly.
 10. Public notification flyer.
 11. CCTV Inspection:
 - a. Initial first day's CCTV inspection external hard drives (HD) within 24 hours after first day's work is completed.
 - b. Subsequent work products/documentation deliverables on routine basis every week.
 - c. Include the following with each inspection submitted:
 - 1) Inspection media.
 - 2) Inspection database.
 - 3) Inspection reports.
 12. Log of cable footage counter calibration checks.

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1.03 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.
2. Crew Chief: Minimum of 5 years' experience on projects similar to this Project and experienced using proposed equipment for this Project. If experience level cannot be met because of new equipment or technology proposed for Project, submit training and experience information for Owner's consideration.

B. Prestartup Meeting: At least 5 days prior to beginning CCTV inspection work, schedule with Engineer to review proposed temporary sewer flow diversion plan, traffic control plans, cleaning, and inspection methods.

C. Acceptance Standard CCTV Video:

1. HD format showing example quality of work that Contractor proposes for Project.
2. Submittal shall also include examples that demonstrate camera advancement speeds, picture clarity, environment condition, lighting, panning as well as focus on defects, title frame, and screen labels for images, and sample stills.
3. Examples shall include a minimum of four manhole to manhole segments and combinations of sizes with a least one 48-inch diameter or greater and at least a brick and clay pipe material.
4. Picture quality and definition shall be to satisfaction of Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Complete closed-circuit television (CCTV) inspection for pipe segments as indicated on Drawings.

1. Label assets and structures in their inspection records using same identification nomenclature as shown on Drawings.
2. If pipe or structure is not shown or listed, identify by downstream structure with letter designation added starting with "A" for each unidentified structure on each pipe segment. Subsequent upstream structures will be identified by adding "B", "C", and so on; include revisions on corrected field map.

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- B. Complete applicable Work specified in Section 01 57 28, Temporary Flow Control, and Section 33 41 01, Storm Drain and Drainage Piping, prior to starting CCTV inspection work.
- C. Record GPS latitude and longitude (decimal degrees) coordinates using portable global positioning system (GPS) device in field for manholes and pipeline access locations used during inspection; include them in inspection information in database and summary report.
- D. Contractor's Project Manager and Crew Chief shall attend regular progress meetings as scheduled by Engineer.
- E. Look-Ahead Schedule: Prepare and submit at least 7 days in advance, identifying areas to be investigated during coming week. Schedules shall include structure numbers, street locations, and dates.
- F. Traffic Control:
 - 1. Conform to requirements of Section 01 50 00, Temporary Facilities and Controls.
 - 2. Notify Engineer at least 7 days in advance of Work starting, of areas where Work will be conducted, and submit traffic control plan.

3.02 NOTIFICATIONS

- A. Public:
 - 1. Provide flyer in English to each residence and business a minimum of 2 working days prior to CCTV operations in area.
 - a. Flyer shall inform occupants of purpose of the Work, what might possibly occur, and telephone numbers to call in case of questions or problems.
 - b. Prior to distribution, date stamp flyers.
 - 2. On daily basis, document distribution of flyers. Documentation, at a minimum, shall include:
 - a. Maps showing areas notified.
 - b. Date distributed.
 - c. Name of person distributing flyers.
 - 3. Provide flyer distribution information to Engineer on a daily basis.
 - 4. Schedule work to be completed within 5-working day window established by distribution of public notices. If the Work is unable to be completed in notified area before end of the 5 working days, renotify area prior to resuming Work.

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3.03 EQUIPMENT

A. Inspection Vehicle:

1. Equipped with monitoring equipment specifically compatible with sewer inspection equipment.
2. Equipped with a safety backup alarm and traffic warning flashers.
3. Clearly marked with the inspection company name and phone number.

B. Inspection Equipment:

1. Inspection equipment that fails to produce satisfactory inspection quality shall be removed from the Work.
2. Monitoring Studio:
 - a. Equipped with independent power source.
 - b. Equipped with lights.
 - c. Temperature controlled.
 - d. Size: Sufficient to allow seating for a minimum of two people in addition to operating technician.
 - e. Television Monitor:
 - 1) Locate in monitoring studio.
 - 2) Capable of producing high quality color picture.
 - 3) Resolution: No less than 500 lines.
 - 4) Continuous display during survey.
3. Transport Platform:
 - a. Self-propelled, mounted on skid, or mounted on float.
 - b. Sized for each pipe diameter in accordance with manufacturer's recommendations.
 - c. Cables: 1,000 feet long, minimum.
 - d. Equipped with tag line suitable for pulling camera backwards.
 - e. Equipped with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
 - 1) When powered and controlled winches are used to pull television camera through line, provide telephones, radios, or other means of communication between the two manholes to ensure communications exist between crewmembers.
 - f. Remote Reading Footage Counter:
 - 1) Accuracy: 0.20 feet over length of section being inspected.
 - 2) Counter display located in monitoring studio.
 - 3) Marking on cable will not be allowed.
 - 4) Calibration: Perform each day prior to setup.

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- g. Secure cable, chains, and other devices used with camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.
- 4. Television Camera:
 - a. Closed-circuit color television camera.
 - b. Sufficient for 6–inch through 60–inch diameters and in accordance with manufacturer’s recommendations.
 - c. Mounted on transport platform.
 - d. Operative in 100 percent humidity conditions without lens fogging.
 - e. Operative in hazardous and corrosive environment and specifically designed for pipeline inspection.
 - f. Camera Lighting:
 - 1) Mounted on and turned in direction of camera head.
 - 2) Light Sensitivity: Greater than 1.5 lux minimum.
 - 3) Minimize reflective glare.
 - 4) Remote variable intensity control.
 - 5) Provide clear, in-focus picture of entire inside periphery of pipe.
 - 6) Ability to achieve proper balance of tint and brightness.
 - g. Resolution:
 - 1) Horizontal Resolution: 460 lines minimum.
 - 2) Vertical Resolution: 400 lines minimum.
 - 3) Meet or exceed monitor resolution.
 - h. Rotation: 360 degrees.
 - i. Pan and Tilt: 270 degrees, with adjustable supports designed for operation in connection with pipe inspection.
 - j. Viewing Angle: 65 degrees, minimum.
 - k. Focus and Iris Controls:
 - 1) Automatic or remote.
 - 2) Remote control adjustment for focus and iris shall be located in monitoring studio.
 - l. Focal Distance: Adjustable through range from 6 inches to infinity.
 - m. Zoom: Capable of 40:1 (10x optical, 4 times digital).

C. Inspection Software:

1. Inspection equipment shall utilize software capable of providing complete survey reports, inspection database, and linked media files.
2. Coding system shall be certified by NASSCO in accordance with their Pipeline Assessment and Certification Program (PACP).

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3.04 INSPECTION

A. Video Recording:

1. CCTV inspection is represented by one manhole-to-manhole pipe segment or other access-to-access point; not multiple manhole-to-manhole segments.
2. Prior to beginning CCTV inspection, complete initial screen text step and position camera at center of manhole and with axis at centerline of pipe.
3. Before camera enters pipe, inspection shall provide internal video of manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up towards manhole opening.
4. Show continuous footage reading on inspection image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).
5. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.
6. If during inspection operation television camera will not pass through entire line segment due to obstruction, set up equipment so inspection can be performed from opposite manhole.
7. If upstream(reverse) setup, is required, establish new inspection run separate from downstream (normal) setup.
8. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
9. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter, such that camera lens becomes obscured, stop inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream (for example, placement of flow plugs or freshwater flushing in pipe).
10. Record inside of each lateral and connection of lateral to pipeline.
11. Recordings shall clearly show defects and observations, and their severity, in addition to obvious features (such as, laterals and joints).
12. Immediately report to Engineer obstructions that restrict flow and cause inspection to be interrupted. Document condition with still photographs, and begin inspections of other pipelines.
13. Camera Operation:
 - a. Speed: 30 feet per minute, maximum, during inspection.

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- b. Stop, for a minimum of 5 seconds, at every lateral, or other defect or adversity.
 - c. Pan entire diameter or area of pipe at each defect and lateral connection.
 - d. Readjust lens, lighting, and focus in order to ensure clear, distinct, and properly lighted image of defect.
14. Loss of color or severe red or green color will be cause for rejection of inspection.
15. Recordings shall be without distortion or outside interference.
16. Televising line segments from structure-to-structure on same HD in continuous run.
- a. Video shall clearly show camera starting and ending at structure, unless defects do not allow it.
 - b. Do not perform partial televising on one HD and then complete run on another HD.
 - c. If line is partially televised, as a result of an excusable condition, (for example, collapsed line), televised length shall be viewed by Engineer for acceptability.
 - d. If portion of line is unacceptable, entire segment shall be deemed unacceptable and shall be retelevised.
17. Engineer may accept physical inspection that does not adhere to minimum standards if adverse conditions are encountered and reinspection is not advised. In such a case, enough data shall be provided to permit accurate assessment.

B. Measurement:

- 1. Record in English units.
- 2. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.
- 3. Verify pipe material (such as, RCP, VCP, CMP) and surface lengths between manholes.
- 4. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.
- 5. Footage measurements shall begin at centerline of upstream manhole, unless Engineer approves otherwise.
- 6. Continuous Footage Readings:
 - a. Use to identify location of defects.
 - b. Accurate to within plus or minus 0.20 foot tolerance.
 - c. Defect identifications are to be called out and recorded to nearest 0.10 foot.
 - d. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.

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7. Measurement shall be zeroed after each segment inspected.
8. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.

3.05 RECORDING OF DOCUMENTATION

A. Upon completion of CCTV inspection, transfer inspection data to external hard drive (HD) of sufficient capacity and compatibility with Owner's equipment; include code required for proper playback of video file.

1. Labeling:
 - a. Provide printed label on outside of HD that indicates the following:
 - 1) Name of Owner.
 - 2) Project title.
 - 3) Date of inspection.
 - 4) Inspection company.
 - 5) Deliverable number.

B. Media:

1. Video:
 - a. Inspections completed, with a unique filename per inspection.
 - b. Encoded in .WMV, .MPG, or .AVI format.
 - c. Opening Screen: The following is an example of required on-screen text display fields:
 - 1) Date and Time: (YYYY/MM/DD), (military time hh:mm).
 - 2) Surveyor's Name/Company: John Doe/ABC Company.
 - 3) Project Name: XYZ project.
 - 4) Location: 1 Example Street.
 - 5) Location Code: B – Example Highway.
 - 6) Upstream MH No: ### (Feature_ID or Facility_ID).
 - 7) Upstream MH depth: ##.# (nearest tenth of a foot).
 - 8) Downstream MH No: ### (Feature_ID or Facility_ID).
 - 9) Pipe Segment Ref. ##### (Feature_IDs).
 - 10) Starting Footage: ###(nearest tenth of foot).
 - 11) Inspection Direction: Downstream or upstream.
 - 12) Pipe Material: Example, ductile iron.
 - 13) Pipe Diameter/Height/Width: Diameter: ##/Height: ##/Width: ## (as measured in field).
 - 14) Weather: Example, snow.
 - 15) Precleaning: Example, jetting.
 - 16) Additional Information: Additional important information/comments.

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- d. Continuous View: Following is list of required on-screen text display fields:
 - 1) Inspection date and time.
 - 2) Continuous forward and reverse readout of cameral distance from center of manhole reference (tape counter footage).
 - 3) Pipe structure identification number.
 - 4) Defect/observation code(s) (when encountered).
 - 2. Audio:
 - a. Embedded in video file.
 - b. Operator shall include description of inspection setup, including related information from log form and unusual conditions.
 - c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal).
 - d. Verbal description and location of each defect.
 - e. Verbal description and location of each service connection.
 - 3. Still Photographs:
 - a. Provide digital photographs showing inspection image whenever observation or defect is recorded.
 - b. Each with unique filename.
 - c. Encoded in .JPEG format.
 - d. Minimum 640 by 480 resolution.
 - e. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code.
- C. Database:
- 1. Include all inspections. Creating a database per inspection is not acceptable.
 - 2. Provide database of collected data including:
 - a. Asset information.
 - b. Inspection information, where each inspection includes no more than one manhole-to-manhole segment.
 - c. Defect codes and scores.
 - d. Start and stop footages for continuous defects.
 - 3. File Type: MSAccess, .MDB, .ACCDB.
 - 4. Database Format: NASSCO PACP data shall be exported into standard PACP Exchange database.
 - 5. List inspection media names in corresponding asset/inspection/defect information field within database.

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D. Inspection Reports:

1. Provide .PDF inspection reports including:
 - a. Summary of inspections completed. An example summary inspection report is shown as a supplement at the end of this section.
 - b. Pipe graphs of each inspection showing asset information and defects/observations.
2. Field Maps:
 - a. Corrected to reflect actual field conditions.
 - b. Illustrate changes in pipe routing that differ from anticipated network. Are not necessary for pipe segments whose routing is as indicated on Drawing.
 - c. Neatly strike out wrong data using green pencil and clearly mark in correct data, using red pencil. Show notes that clarify changes in blue pencil.

3.06 FIELD QUALITY CONTROL

- A. Review videos and reports to resolve inconsistent and conflicting data and to improve accuracy of data prior to submittal.
- B. If minimum level of accuracy is not met between videos and reports after review by Engineer, perform reinspection of pipes that do not meet requirements.
- C. Quality control procedures shall be in accordance with method attached as a supplement at the end of this section.

3.07 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are a part of this specification.
 1. Inspection Summary Sheet.
 2. NASSCO PACP Quality Control.

END OF SECTION

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INSPECTION SUMMARY SHEET

**[SAMPLE—CUSTOMIZE FOR OWNER OR INSERT OWNER’S INSPECTION LOG SHEET
IF THEY HAVE ONE THEY LIKE TO USE]**

[illegible]

NASSCO PACP QUALITY CONTROL PROCEDURE

General Method

CCTV contracting companies shall have a Random Number Quality Control procedure in place that is then audited by client. A random number is one of a series of numbers that have no detectable pattern, so that each and every item in a known population has an equal chance of being selected based upon random number. A minimum of 5 percent of CCTV contractor's data shall be checked using a Random Number Quality Control procedure as basis of selecting inspections for review. Intent is for Client to actually audit CCTV contractor's QC procedure rather than performing their own QC. If there is doubt about results then Client can ask for another differing set of Random Numbers to be created and be applied to CCTV operator in question, thereby generating another different set of inspections to be checked. Create QC history for each CCTV operator and not for each contract.

Generating Random Numbers

A Random Number list, based upon population and selection percentage, is available from many web sites. This site generates a list of random numbers that can be sorted in numerical order and printed. Each CCTV operator shall have a different set of Random Numbers.

Selection of Inspections to be Checked

In the field, CCTV operator inspects each sewer segment and enters PACP information into a computer database. In the office, QC employee/operator counts through inspections, for each separate CCTV operator, in the order in which they were inspected. When inspection coincides with a Random Number a copy of inspection is made from HD/DVD onto CCTV operator's master QC HD/DVD. A copy of corresponding CCTV report is also printed from computer. These are then kept in CCTV operator's QC folder until QC is carried out by qualified QC employee/operator. By using the Random Number sampling system CCTV operator will not be able to "abuse" system. Client can ask for the set of Random Numbers for each CCTV operator at start of Project, or Client can provide a set of Random Numbers to be used for each operator associated with Project.

Quality Control of Inspection

It is expected that accuracy of Header record exceeds 90 percent as most field contents are based upon facts. The simplest method for QC of Header record is as follows:

Each field completed, and those that are not but should have been, is counted, producing a "number of fields checked", say 32 (ignoring unused fields).

Then fields with mistakes are counted, irrelevant of level of the mistake, creating an "error count" say for this example, 2.

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Therefore, calculation is:

$(\text{error count} / \text{number of fields checked}) * 100 = \text{percentage error}$
 $100 - \text{percentage error} = \text{accuracy percentage}$

$(2 / 32) * 100 = 6.25\%$

$100\% - 6.25\% = 93.75\%$ accuracy level

This percentage accuracy level is then entered onto a graph so that ongoing accuracy can easily be seen, again, for each CCTV operator.

Detail Information

It is expected that accuracy of Observation/Defect codes exceed 90 percent.

As with Header records, each field that has been completed in the Detail records is added up, irrelevant of whether it is a Clock At/To, the Continuous Defect field or Distance/Video digits. Each entry is treated as equally important. From this number of entries made in the Detail section, a figure is arrived. A qualified QC employee/operator then looks through the same inspection and checks accuracy of each field and reaches two values, the number of entries that should have been made and an error count. No attempt should be made to create a new inspection from scratch, just check what has already been reported on. If a defect is not recorded then number of fields that support the missed defect is added to Error Count, for instance, if CCTV operator misses an EMJ then error count increases by at least five errors:

Video Digit, Distance, Code, Clock At and To and the percent

The five errors must also be added to number of entries that should have been made as well as any other errors to reach a total number of entries. Therefore at the end each inspection there are two values, the number of entries that should have been made and the error count. Calculation for Quality Control of each inspection is as follows:

$(\text{Error Count} / \text{Number of entries that should have been made}) * 100 = \text{Percentage Error}$

$100 - \text{Percentage Error} = \text{Accuracy Level}$

Assume number of entries made should have been 122 Assume Error Count is 8:

$(8 / 122) * 100 = 6.5\%$

$100\% - 6.5\% = 93.5\%$ Accuracy Level

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This percentage Accuracy Level is then entered onto a graph so that ongoing level can be easily seen for each CCTV Operator.

Summary

QC inspection information for each sewer segment checked is entered into QC forms so that an Audit trail can be established. There must be hard copies of each inspection checked with Errors and Omissions clearly marked. Accuracy Level calculations must also be entered into QC logs. Random Number must be entered against each aspect of QC procedure. A continuing Accuracy Level Graph must be kept up to date for each CCTV operator; it is acknowledged that results could be as much as 1 month behind time of inspection.

**SECTION 33 05 13
MANHOLES**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO): M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
 2. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A48/A48M, Standard Specification for Gray Iron Castings.
 - c. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - d. A536, Standard Specification for Ductile Iron Castings.
 - e. A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - f. B139/B139M, Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.
 - g. C14, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 - h. C31/C31M, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - i. C39/C39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - j. C150/C150M, Standard Specification for Portland Cement.
 - k. C192/C192M, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
 - l. C387/C387M, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - m. C443, Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
 - n. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - o. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 - p. C990, Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants.

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- q. C1311, Standard Specification for Solvent Release Sealants.
- r. C1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
- s. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- t. D4101, Standard Specification for Polypropylene Injection and Extrusion Materials.
- u. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- v. F594, Standard Specification for Stainless Steel Nuts.

1.02 SUBMITTALS

A. Action Submittals:

- 1. Shop Drawings including details of construction, reinforcing and joints, anchors, lifting, external straps, erection inserts, and other items cast into members.
- 2. Product Data:
 - a. Concrete mix design.
 - b. Manhole frame to structure seals.
 - c. Manhole frame to structure anchor bolt.
 - d. Rubber gaskets and sealants.
 - e. External joint wrap.

B. Informational Submittals:

- 1. Experience Record:
 - a. Precast concrete production capabilities.
 - b. Evidence of current PCI plant certification.
- 2. Certificate of Compliance: Certify admixtures and concrete do not contain calcium chloride.
- 3. Test Reports: Precast manufacturer's concrete test cylinders.
- 4. Manufacturer's recommended installation instructions.
- 5. Field quality control report.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications:

- 1. Precast Concrete and Precast Prestressed Concrete: Product of manufacturer with 3 years' experience producing precast concrete products of quality specified.
- 2. Precast Plant: PCI certified plant with current certification.

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PART 2 PRODUCTS

2.01 GENERAL

A. Materials of Construction and Service Conditions:

1. Screws, Bolts, or Nuts: Type 304 stainless steel conforming to ASTM F593 and ASTM F594.
2. Gaskets: Internal and external seals shall be made of materials that have been proven to be resistant to the following exposures and conditions:
 - a. Sanitary sewage.
 - b. Corrosion or rotting under wet or dry conditions.
 - c. Gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide, and other trace gases at installation site.
 - d. Biological environment in soils and sanitary sewers.
 - e. Chemical attack by road salts, road oil, and common street spillages or solvents used in street construction or maintenance.
 - f. Temperature ranges, variations, and gradients in construction area.
 - g. Variations in moisture conditions and humidity.
 - h. Fatigue failure caused by a minimum of 30 freeze-thaw cycles per year.
 - i. Vibrations because of traffic loading.
 - j. Fatigue failure because of repeated variations of tensile, compressive and shear stresses, and repeated elongation and compression. Material shall remain flexible allowing repeated movement.
3. Materials shall be compatible with each other and manhole materials.
4. Designed to provide a 20-year service life.

B. Structures shall meet requirements of ASTM C478, this specification and the following:

1. Concrete:
 - a. Cement: Meet requirements of ASTM C150/C150M.
 - b. Compressive Strength:
 - 1) Minimum 4,000 psi.
 - 2) Minimum strength shall be confirmed at 7 days by making two standard cylinders per manhole for testing.
2. Reinforcement: Grade 60, unless otherwise specified.
3. Ring: Custom made with openings to meet indicated pipe alignment conditions and invert elevations.
4. Floor: Below pipe to provide clearance for grouting channels.

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5. Joint:
 - a. Form joint contact services with machined castings.
 - b. Surfaces shall be parallel with nominal 1/16-inch clearing and tongue equipped with recess for installation of O-ring rubber gasket.
6. Gasket: Meet requirements of ASTM C443.

2.02 PRECAST MANHOLES

A. Riser Sections:

1. Fabricate in accordance with ASTM C478.
2. Diameter: Minimum 48 inches.
3. Wall Thickness: Minimum 4 inches or 1/12 times inside diameter, whichever is greater.
4. Top and bottom surfaces shall be parallel.
5. Joints: Tongue-and-groove and confined O-ring with rubber gaskets meeting ASTM C443.

B. Cone Sections:

1. Eccentric.
2. Same wall thickness and reinforcement as riser section.
3. Top and bottom surfaces shall be parallel.

C. Base Sections and Base Slab:

1. Base slab integral with sidewalls.
2. Fabricate in accordance with ASTM C478.

D. Manhole Extensions:

1. Concrete grade rings; maximum 6 inches high.
2. Fabricate in accordance with ASTM C478.

E. Joint Seal Manufacturers and Products:

1. Butyl Gaskets:
 - a. Hamilton Kent, Sparks, NV; Kent-Seal No. 2.
 - b. Henry Company, Houston, TX; Ram-Nek.
 - c. Trelleborg Engineered Solutions, Park Hills, MO; NPC Bidco C-56.
2. Confined Plastic or Rubber O-Ring:
 - a. As recommended by precasting manufacturer.
 - b. Meet requirements of ASTM C443.

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3. External Wrap:
 - a. Sealing Systems, Inc., Loretto, MN; Gator Wrap.
 - b. Henry Company, Houston, TX; RU116 Rubr-Nek External Joint Wrap.
 - c. Trelleborg Engineered Solutions, Park Hills, MO; NPC External Joint Wrap.
 - d. Cretex Specialty Products, Waukesha, WI; Cretex Wrap.

2.03 MANHOLE FRAMES AND COVER

- A. Castings:
 1. Tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and defects.
 2. Cast Iron: ASTM A48/A48M Class 30B.
 3. Ductile Iron: ASTM A536, Grade 60-40-12.
 4. Plane or grind bearing surfaces to ensure flat, true surfaces.
- B. Cover: True and seat within ring at all points.
- C. Watertight Covers: High temper phosphor bronze with 60,000 psi minimum tensile strength meeting ASTM B139/B139M.
- D. Watertight Cover Gasket: Molded from high-quality rubber such as nitrile or EPDM.

2.04 MANHOLE FRAME CONNECTION TO STRUCTURE

- A. Butyl Sealant:
 1. Conform to ASTM C1311, or AASHTO M198 and ASTM C990.
 2. Trowelable or cartridge applied.
 3. Manufacturers and Products:
 - a. Tremco Commercial Sealants and Waterproofing, Beachwood, OH; Tremco Butyl Sealant.
 - b. Bostik, Middleton, MA; Chem-Calk 300.
 - c. Press-Seal Gasket Company, Fort Wayne, IN; EZ-Stik #3.
- B. External Wrap:
 1. Meet requirements of ASTM C923.
 2. Construct of high quality rubber that will provide flexible watertight seal around joint.
 3. Thickness: Minimum 60 mils.

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4. Consist of a top and bottom section and be sealed to structure, frame top, and bottom with mastic as applicable.
5. Length: Extend from manhole frame and extension ring to cone section.
6. Bands: If required, constructed of minimum 16-gauge sheet if channeled, or 5/16-inch diameter if round.
7. Manufacturers and Products:
 - a. Sealing Systems, Inc., Loretto, MN; Infi-Shield.
 - b. Trelleborg Engineered Systems, Milford, NH; NPC Flexrib Frame-Chimney Seals.
 - c. Cretex Specialty Products, Waukesha, WI; X-85 Seal.

C. Internal Wrap or Sealing Membrane:

1. Meet requirements of ASTM C923.
2. Minimum internal thickness of 3/16 inch or as recommended by manufacturer for installation climate.
3. Designed for application and have a demonstrated history of accommodating differential expansion between frame and concrete.
4. Width: Minimum 8 inches.
5. Expansive type wraps shall be fabricated of high quality rubber or urethane.
6. Bands: If required, constructed of minimum 16-gauge sheet if channeled, or 5/16-inch diameter if round.
7. Wrap shall not restrict access to manhole.
8. Manufacturers and Products:
 - a. Sealing Systems, Inc., Loretto, MN; Flex-Seal Utility Sealant.
 - b. Trelleborg Engineered Systems, Milford, NH; NPC Flexrib Frame-Chimney Seals.
 - c. Cretex Specialty Products, Waukesha, WI; Internal Manhole Chimney Seal.

D. Frame to Structure Anchor Bolts:

1. 3/4-inch-diameter HAS stainless steel bolts; minimum 6-5/8-inch embedment.
2. Manufacturer and Product: Hilti; HVA Capsules Adhesive Anchoring System.

2.05 MORTAR

- A. Standard premixed in accordance with ASTM C387/C387M, or proportion one part Portland cement to two parts clean, well-graded sand that will pass a 1/8-inch screen.

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B. Admixtures: May be included; do not exceed the following percentages of weight of cement:

1. Hydrated Lime: 10 percent.
2. Diatomaceous Earth or Other Inert Material: 5 percent.

C. Mix Consistency:

1. Tongue-and-Groove Type Joint: Such that mortar will readily adhere to pipe.
2. Confined Groove (Keylock) Joint: Such that excess mortar will be forced out of groove and support is not provided for section being placed.

2.06 BACKFILL AROUND AND UNDER MANHOLE

A. Fill as specified in Section 502 of the Standard Specifications.

2.07 FLEXIBLE JOINTS FOR SEALING PIPES IN MANHOLE

A. Manufacturers and Products:

1. NPC, Inc., Milford, New Hampshire; Kor-N-Seal flexible rubber boot with stainless steel accessories.
2. A-LOK Products, Inc., Tullytown, PA; Z-LOK XP or A-LOK flexible connectors.

2.08 SOURCE QUALITY CONTROL

A. Prior to delivery of precast manhole sections to Site, yard permeability tests may be required at point of manufacture. Engineer or Owner will select precast sections not to exceed 5 percent of the total project quantity to test from material which is to be supplied to Project. Test specimens shall be mat tested and meet permeability test requirements of ASTM C14.

B. Concrete Testing: Test two concrete test cylinders for each manhole. Compressive strength shall be tested in accordance with ASTM C31/C31M, ASTM C39/C39M, and ASTM C192/C192M.

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C. Inspection:

1. Material Quality:
 - a. Manufacturing process and finished sections shall be subject to inspection and approval by Owner and Engineer.
 - 1) Inspections may take place at manufacturer's plant, at Site after delivery, or at both.
 - 2) Sections not meeting requirements of this Specification or that are determined to have defects which may affect durability of structure are subject to rejection.
 - 3) Sections rejected after delivery shall be removed and replaced.
 - 4) Sections damaged after delivery will be rejected and if already installed shall be repaired to satisfaction of Owner and Engineer.
 - 5) If structure cannot be repaired it shall be removed and replaced entirely at Contractor's expense.
2. At the time of inspection the sections will be carefully examined for compliance with ASTM C478 and with manufacturer's drawings. Sections will be inspected for general appearance, dimensions, scratch strength, blisters, cracks, roughness, and soundness. Surface shall be dense and close textured.
3. Imperfections may be repaired, subject to approval of Engineer, after demonstration by manufacturer that strong and permanent repairs result.

PART 3 EXECUTION

3.01 GENERAL

A. Prior to installation inspect materials:

1. Sections not meeting requirements of this specification or that are determined to have defects which may affect durability of structure are subject to rejection.
2. Sections damaged after delivery will be rejected and if already installed shall be repaired to satisfaction of Owner and Engineer.
3. Remove and replace structure that cannot be repaired.

B. If needed, dewater excavation during construction and testing operations.

3.02 EXCAVATION AND BACKFILL

A. Excavation: As specified in Section 31 23 16, Excavation.

B. Backfill: As specified in Section 502 of the Standard Specifications.

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3.03 INSTALLATION OF PRECAST MANHOLES

A. Concrete Base:

1. Precast:
 - a. Place on compacted structural fill.
 - b. Properly locate, ensure firm bearing throughout, and plumb first section.
2. Cast-in-Place:
 - a. Invert: Minimum 8 inches below lowest connecting pipe.
 - b. First section of manhole shall be cast in concrete base.

B. Sections:

1. Inspect precast manhole sections to be joined.
2. Clean ends of sections to be joined.
3. Do not use sections with chips or cracks in tongue.

C. Preformed Plastic Gaskets or Rubber O-Ring:

1. Use only pipe primer furnished by gasket manufacturer.
2. Install gasket material in accordance with manufacturer's instructions.
3. Completed Manhole: Rigid and watertight.

D. Mortar Joints:

1. Thoroughly wet joint with water prior to placing mortar.
2. Place mortar on groove of lower section prior to section installation.
3. Fill joint completely with mortar of proper consistency.
4. Trowel interior and exterior surfaces smooth on standard tongue-and-groove joint.
5. Prevent mortar from drying out and cure by applying approved curing compound or comparable approved method.
6. Do not use mortar mixed for longer than 30 minutes.
7. Chip out and replace cracked or defective mortar.
8. Completed Manhole: Rigid and watertight.

E. External Joint Wraps: Install in accordance with manufacturer's instructions.

F. Extensions:

1. Provide on manholes in streets or other locations where change in existing grade may be likely.
2. Install to height not exceeding 12 inches.
3. Lay grade rings in mortar with sides plumb and tops level.
4. Seal joints with mortar as specified for sections and make watertight.

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3.04 MANHOLE INVERT

- A. Construct with smooth transitions to ensure unobstructed flow through manhole. Remove sharp edges or rough sections that tend to obstruct flow.
- B. Where full section of pipe is laid through manhole, break out top section and cover exposed edge of pipe completely with mortar. Trowel mortar surfaces smooth.

3.05 MANHOLE FRAMES AND COVERS

- A. Install concrete grade rings as required to set covers flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.
- B. Set frames in three equally spaced beads of butyl sealant that run full circumference of frame.
- C. Anchor frame to manhole with specified bolts.
- D. Install exterior manhole frame to structure seals in accordance with manufacturer's instructions. Seal shall cover grade rings.

3.06 WATERTIGHT MANHOLES

- A. Unless otherwise noted, manholes covers shall be bolted down with sealing gasket.

3.07 MANHOLE PIPING

- A. Drop Assembly: See Drawings for detail of installation requirements.
- B. Flexible Joints:
 - 1. Provide in pipe not more than 1-1/2 feet from manhole walls.
 - 2. Where last joint of pipe is between 1-1/2 feet and 6 feet from manhole wall, provide flexible joint in manhole wall.
- C. Stubouts for Future Connections:
 - 1. Provide same type and class of pipe as specified for use in service connection, lateral, main, or trunk sewer construction. Where there are two different classes of pipe at manhole use higher strength pipe.
 - 2. Grout pipe in precast walls or manhole base to provide watertight seal or use flexible joints as specified herein.
 - 3. Maximum Length: 1-1/2 feet outside manhole wall.

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4. Construct invert channels as shown. Unless otherwise approved by Engineer, match inside top elevation of service connection pipe to inside top elevation of outlet pipe.
5. Test Plugs:
 - a. Install rubber-gasketed plugs in end of stubouts with gasket joints similar to sewer pipe being used.
 - b. Plugs shall withstand internal or external pressures without leakage.
 - c. Adequately brace plugs against hydrostatic or air test pressures.
- D. Permanent Plugs: Clean interior contact surfaces of pipes to be cut off or abandoned as shown, and construct plug as follows:
 1. Pipe 18 Inches or Less in Diameter: Concrete plug in end, minimum 2 feet long.
 2. Pipe 20 Inches and Larger: Concrete plug in end, minimum 4 feet long.
 3. Plugs shall be watertight and capable of withstanding internal and external pressures without leakage.

3.08 MANHOLES OVER EXISTING PIPING

- A. Maintain flow through existing pipelines at all times.
- B. Concrete Pipe: Apply bonding agent on surfaces in contact with concrete.
- C. Construct base under existing piping.
- D. Construct manhole as detailed in Drawings.
- E. Apply minimum of two complete wraps of hydrophilic waterstop centered on pipe in wall.
- F. Place a minimum of 24 inches of concrete around each pipe penetration outside manhole against undisturbed soil or compacted aggregate unless otherwise detailed.
- G. Grout channel through manhole.
- H. Saw cut out or demolish existing pipe within new manhole using method approved by Engineer.
- I. Protect new concrete or grout for 7 days after placing concrete.

3.09 CONNECTIONS TO EXISTING MANHOLES

- A. Core manhole bases and grouting as necessary.

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- B. Seal pipe in manhole using flexible connector.
- C. Regrout to provide smooth flow into and through manholes.
- D. Provide diversion facilities and perform work necessary to maintain flow during connection.

3.10 FIELD QUALITY CONTROL

- A. Conduct negative air pressure (vacuum) test on all manholes in accordance with ASTM C1244. Conduct tests in presence of Engineer.
- B. Hydrostatic Testing:
 - 1. When, in Engineer's opinion, groundwater table is too low to permit visual detection of infiltration leaks, hydrostatically test all manholes.
 - 2. Procedure: Plug inlets and outlets and fill manhole with water to height determined by Engineer.
 - 3. Manhole may be filled 24 hours prior to time of testing, if desired, to permit normal absorption into pipe walls to take place.
 - 4. Leakage in each manhole shall not exceed 0.1 gallon per hour per foot of head above invert.
 - 5. Repair manholes that do not meet leakage test, or do not meet specified requirements from visual inspection.
 - 6. If more than 25 percent of manholes tested fail the hydrostatic test, test all or as many manholes as Engineer deems necessary.

END OF SECTION

SECTION 33 05 16.13
BOX CULVERT

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO): HB-17, Standard Specifications for Highway Bridges, Division 1 Section 3, Division I Design-Loads (Part A, Part B, Part C).
 2. ASTM International (ASTM):
 - a. A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - b. A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - c. C31/C31M, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - d. C39/C39M-21, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - e. C387/C387M, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - f. C497-20e1, Standard Test Methods for Concrete Pipe, Concrete Box Sections, Manhole Sections, or Tile.
 3. Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1926.502, Fall Protection Systems Criteria and Practices.

1.02 SUBMITTALS

- A. Action Submittals:
1. Shop Drawings:
 - a. Detailed drawings showing complete information for fabrication including, but not limited to:
 - 1) Member dimensions and cross sections; location, size, and type of reinforcement, including additional reinforcement.
 - 2) Layout dimensions and identification of each precast unit.
 - 3) Welded connections indicated by AWS standard symbols.
 - 4) Details of connections, joints, accessories, and openings or inserts.
 - 5) Watertight joint details.
 - 6) Location and details of anchorage devices.
 - 7) Access door details.

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- b. Product Data:
 - 1) Precast concrete items; show materials of construction by ASTM reference and grade.
 - 2) Joint sealants.

B. Informational Submittals:

- 1. Manufacturer's data for lifting devices for handling and erection.
- 2. Manufacturer's certification that box culvert manufacture comply with referenced ASTMs.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Store each unit in a manner that will prevent cracking, distortion, warping, straining and other physical damage, and in a manner to keep marking visible.
- B. Lift and support each unit only at designated lifting points and supporting points as shown on Shop Drawings.

PART 2 PRODUCTS

2.01 PRECAST BOX CULVERT

- A. As shown on Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. Possible Settlement: If subgrade is encountered that may require removal to prevent structure settlement, notify Engineer. Engineer will determine depth of over excavation and means of stabilizing subgrade prior to structure installation.
- B. Place 6-inch minimum thickness of imported crushed aggregate material on undisturbed earth or modified subgrade; thoroughly compact with a mechanical vibrating or power tamper. Meet requirements of Article Excavation and Backfill.

3.02 EXCAVATION AND BACKFILL

- A. Remove and keep water clear from excavation during construction.
- B. Excavation: As specified in Section 31 23 16, Excavation.

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- C. Backfill: As specified in Section 502 of the Standard Specifications, and Section 208 of the Standard Specifications.

3.03 INSTALLATION

- A. Place on prepared subgrade.
- B. Carefully inspect precast sections to be joined.
- C. Thoroughly clean ends of sections to be joined.
- D. Do not use sections with chips or cracks.
- E. Joints:
 - 1. Fill joints between precast sections per manufacturer's recommendation.
 - 2. Joints shall be watertight to prevent entrance of groundwater.
- F. Setting Box Culvert: Install box culvert to elevations shown on Drawings.

END OF SECTION

SECTION 33 41 01
STORM DRAIN AND DRAINAGE PIPING

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section and any supplemental Data Sheets:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. M36M, Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
 - b. M190M, Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - c. M196M, Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains.
 2. ASTM International (ASTM):
 - a. C14, Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
 - b. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - c. C150, Standard Specification for Portland Cement.
 - d. C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
 - e. C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
 - f. C443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - g. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
 - h. C595, Standard Specification for Blended Hydraulic Cements.
 - i. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - j. C655, Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.
 - k. C700, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
 - l. C1012, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.

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- m. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
- n. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.02 DEFINITIONS

- A. CCTV: Closed-Circuit Television.
- B. CMP: Corrugated Metal Pipe.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. Certificates:
 - a. Manufacturer's Certificate of Compliance, that products furnished meet requirements of this section.
 - b. Certification of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
 - c. Certified statement from manufacturer of gaskets, setting forth that basic polymer used in gaskets and test results of physical properties of compound are in accordance with ASTM C361 for reinforced concrete pipe.
 - 2. Manufacturer's Written In-Plant Quality Control Program: Quality control procedures and materials testing to be used throughout manufacturing process. Submit prior to manufacture of any pipe for this Project.
 - 3. Letter from independent testing agency certifying that pipe furnished meets requirements of this section.
 - 4. Test or historical performance data to verify that joint design meets requirements of these Specifications.
 - 5. Provide pipe and pipe joint test results with delivery of pipe. Do not deliver pipe not meeting test requirements to Project Site.
 - 6. Manufacturer's written recommendations for pipe handling and installation.
 - 7. Field Leakage Testing Plan: Submit at least 15 days in advance of testing and include at least the following:
 - a. Testing dates.
 - b. Piping systems and sections to be tested.
 - c. Test type.
 - d. Method of isolation.
 - e. Method of conveying water from source to system being tested.

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- f. Calculation of maximum allowable leakage for piping section(s) to be tested.
 - g. Method for disposal of test water, if applicable.
- 8. CCTV Inspection Equipment in accordance with Section 33 01 30.16, Television Inspection of Sewer Pipelines.
- 9. Leakage test results.
- 10. Pipe deflection test results.
- 11. CCTV inspection in accordance with Section 33 01 30.16, Television Inspection of Sewer Pipelines.

1.04 QUALIFICATIONS

- A. In accordance with Section 33 01 30.16, Television Inspection of Sewer Pipelines.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. As specified in the Data Sheets following “End of Section.”

2.02 GASKET LUBRICANT

- A. Lubricant shall be supplied by pipe manufacturer and no substitute or “or-equal” will be allowed.

2.03 CMP COUPLING BANDS

- A. Coupling bands and other hardware for galvanized or aluminized steel pipe shall conform to requirements of AASHTO M36 for steel pipe and AASHTO M196 for aluminum pipe.
 - 1. Coupling bands shall be not more than three (3) nominal sheet thicknesses lighter than thickness of pipe to be connected and in no case lighter than fifty-two thousandths inch (0.052 In) for steel or forty-eight thousandths inch (0.048 In) for aluminum.
 - 2. Coupling bands shall be made of same base metal and coating (metallic or otherwise) as pipe.
 - 3. Minimum width of corrugated locking bands shall be as shown below for corrugations which correspond to end circumferential corrugations on pipes being joined:
 - a. Ten and one-half inches (10-1/2 In) wide for two and two-thirds inch by one-half inch (2-2/3 In x 1/2 In) corrugations.
 - b. Twelve inches (12 In) wide for three inch by one inch (3 In x 1 In) corrugations.

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4. Helical pipe without circumferential end corrugations shall be permitted only when it is necessary to join new pipe to existing pipe which was installed with no circumferential end corrugations. In this event pipe furnished with helical corrugations at ends shall be field jointed with either helically corrugated bands or with bands with projections (dimples). Minimum width of helical corrugated bands shall conform to following:
 - a. Twelve inches (12 In) wide for one-half inch (1/2 In) deep helical end corrugations.
 - b. Fourteen inches (14 In) wide for one inch (1 In) deep helical end corrugation.
5. Bands with projections shall have circumferential rows of projections with one (1) projection for each corrugation. Width of bands with projections shall be not less than following:
 - a. Twelve inches (12 In) wide for pipe diameters up to and including seventy-two inches (72 In). Bands shall have two (2) circumferential rows of projections.
 - b. Sixteen and one-quarter inches (16-1/4 In) wide for pipe diameters of seventy-eight inches (78 In) and greater. Bands shall have four (4) circumferential rows of projections.
6. Bolts for coupling bands shall be one-half inch (1/2 In) diameter. Bands twelve inches (12 In) wide or less shall have minimum of two (2) bolts per end at each connection and bands greater than twelve inches (12 In) wide shall have minimum of three (3) bolts at each connection.
7. Galvanized bolts may be hot dip galvanized in accordance with requirements of AASHTO M232, mechanically galvanized to provide same requirements as AASHTO M232 or electro galvanized per ASTM B633, Type RS.

2.04 PIPE TO MANHOLE CONNECTOR

- A. As specified in Section 33 05 13, Manholes.

2.05 FLEXIBLE COMPRESSION COLLAR

- A. Mechanical joint coupling with No. 305 stainless steel bands.
- B. Manufacturers:
 1. Calder, Inc., Bellflower, CA.
 2. Fernco Inc., Davison, MI.
 3. Pipeconx Division of Uniseal; Evansville, IN.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Notify Engineer immediately of manufacturing imperfections or damage caused by improper handling.
- B. Verify size, pipe condition, and pipe class prior to installation of pipe.
- C. Repairs to RCP pipe section will be allowed only if approved, in writing, by Engineer. Damaged pipe which, in opinion of Engineer, cannot be repaired, will be rejected and removed from Project Site.

3.02 PREPARATION

- A. Pipe Distribution: Do not distribute more than 1 week's supply of materials in advance of laying, unless otherwise approved by Engineer.
- B. Inspect pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used.
- C. Remove foreign matter and dirt from inside of pipe and fittings and keep clean during and after laying. Wash ends of section clean with wet brush prior to joining sections of pipe.

3.03 INSTALLATION OF PIPE, FITTINGS, AND APPURTENANCES

- A. General:
 - 1. Install pipe sections in accordance with manufacturer's recommendations.
 - 2. Provide and use proper implements, tools, and facilities for safe and proper prosecution of Work.
 - 3. Lower pipe, fittings, and appurtenances into trench, piece by piece, by means of crane, slings, or other suitable tools and equipment, in such a manner as to prevent damage to pipe materials, protective coatings, and linings. Do not drop or dump pipe into trenches.
- B. Line and Grade:
 - 1. Establish line and grade for pipe by use of lasers.
 - 2. Measure for grade at pipe invert, not at top of pipe.

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3. Pipe invert may deviate from line or grade up to 1/2 inch for line and 1/4 inch for grade, provided that finished pipe line will present a uniform bore, and such variation does not result in a level or reverse sloping invert, or less than minimum slope shown.
4. Pipe bedding shall form continuous and uniform bearing and support for pipe barrel between joints. Pipe shall not rest directly on bell or pipe joint.
5. Prevent entry of foreign material into gasketed joints.
6. Plug or close off pipes that are stubbed off for manhole, concrete structure, or for connection by others, with temporary watertight plugs.

C. Laying and Jointing:

1. Use gasket lubricant as recommended by gasket manufacturer.
2. Lay pipe upgrade with bell ends pointing in direction of laying.
3. When field cutting or machining pipe is necessary, use only tools and methods recommended by pipe manufacturer and approved by Engineer.
4. Excavate bell holes at each joint to permit correct assembly and inspection of entire joint.
5. After section of pipe has been placed in its approximate position for jointing, clean end of pipe to be joined, inside of joint, and rubber ring immediately before joining pipe.
6. Assemble joint in accordance with recommendations of manufacturer.
7. Apply sufficient pressure in making joint to assure that joint is correctly assembled as defined in standard installation instructions provided by pipe manufacturer. Inside joint space shall not exceed 50 percent of pipe manufacturer's recommended maximum allowance.
8. Place pipe to specified line and grade to form smooth flow line.
9. Ensure that bottom of pipe is in contact with bottom of trench for full length of each section.
10. Check for alignment and grade after joint has been made.
11. Place sufficient pipe bedding material to secure pipe from movement before next joint is installed.
12. When pipe is laid within movable trench shield, take precautions to prevent pipe joints from pulling apart when moving shield ahead.
13. When laying operations are not in progress, and at close of day's work close and block open end of last laid section of pipe to prevent entry of foreign material or creep of gasketed joints.
14. Take precautions to prevent "uplift" or floating of line prior to completion of backfill operation.
15. Connections between one pipe material and another shall be by means of flexible compression collar, installed in accordance with manufacturer's recommendations, or concrete closure collar.

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D. Gasketed Joint Protection:

1. Point interior joints with openings greater than 3/8 inch on 24-inch and larger concrete pipe. Point (fill with joint cement mortar) 360 degrees of circumference. Quick setting grout may be substituted for joint cement mortar when approved by Engineer.
 - a. Thoroughly clean joint of lubricant materials and dirt.
 - b. Prewet joint before applying mortar.
 - c. Pointing shall be done in such a manner that there are no bulges, ridges, or other irregularities.
 - d. Pointing shall be flush with interior of pipe.

E. Connection to Structure or Manhole:

1. Locate standard pipe joint within 1.5 feet of outside face of structure for pipe 18 inches and smaller and within one pipe diameter for pipe 21 inches and larger.
2. Plug or close off pipe stubbed with watertight plug.
 - a. Connect pipe to manhole with pipe to manhole connector in accordance with manufacturer's recommendations.

3.04 SEWER CLEANING

- A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by Engineer, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.
- B. Upon Engineer's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, reflush and clean the sections and portions of the lines as required.

3.05 TESTING

A. General:

1. Notify Engineer in writing 5 days in advance of testing. Perform testing in presence of Engineer.
2. Test pipe 18 inches in diameter and smaller for leakage using Hydrostatic Exfiltration or Pneumatic Test Methods at Contractor's option.
3. Test pipe over 18 inches in diameter for leakage using Hydrostatic Exfiltration Test Method.

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4. Individual joints may be tested on pipe 36 inches in diameter and larger at Contractor's option.
5. Pipe shall successfully pass leakage test prior to acceptance.
6. Test sections of constructed sewer between stations only after service connections, manholes, and backfilling are completed.
7. Isolate new pipelines that are connected to existing pipelines for testing. Install pipe plugs as required to allow section of new pipe to be pressure tested.
8. Furnish testing equipment and perform tests as approved by Engineer. Testing equipment shall provide observable and accurate measurement of test pressure and amount of water needed to maintain specified conditions.
9. Supply of Temporary Water: As stated in Section 01 50 00, Temporary Facilities and Controls.
10. Dispose of water used in testing in accordance with federal, state, and local requirements.

B. Hydrostatic Exfiltration Test:

1. If groundwater is present and is 2 feet and above the top of pipe for the segment being tested, conduct an infiltration test.
2. For RCP pipe, fill pipe test section 24 hours prior to time of testing, if desired, to permit normal absorption into pipe walls.
3. Procedure:
 - a. Maximum filling velocity shall not exceed 0.25 foot per second, calculated based on full area of pipe.
 - b. Expel air from piping system during filling.
 - c. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
 - d. Maintain hydrostatic test pressure continuously for 2 hours minimum, adding additional water only as necessary to maintain test pressure.
 - e. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.
4. Measurement Accuracy: Plus or minus 1/8 gallon of water leakage under specified conditions.
5. Concrete Pipe and Joints: Maximum allowable water loss is 1.5 gallon(s) per inch diameter per 1,000 feet of pipe, including service connections within test section per 2 hours. Modify allowable leakage as stated below if hydrostatic head is other than 6 feet.

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6. Hydrostatic Head:
 - a. At least 2 feet above maximum estimated groundwater level in section being tested, but no less than 6 feet above inside top of highest section of pipe in test section, including service connections.
 - b. In every case, determine height of water table at time of test by exploratory holes or such other methods approved by Engineer. Engineer will make final decision regarding test height for water in pipe section being tested.
 - c. If hydrostatic head is other than 6 feet, adjust allowable leakage as computed by criteria above by dividing square root of actual head by square root of 6 and multiplying result by allowable leakage stated above.
7. Length of Pipe Tested: Limit length such that pressure on invert of lower end of section does not exceed 16 feet of water column. In no case shall length be greater than 700 feet or distance between manholes when greater than 700 feet.
8. Dispose of test water in a manner that will not damage or interfere with adjacent property and in a manner acceptable with Engineer and regulatory agencies.

C. Hydrostatic Joint Testing:

1. If pipe fails to pass hydrostatic test and location of leak cannot be readily identified, conduct individual joint tests. After leaking joints have been located and repaired, retest pipeline. As alternative to filling entire pipe and measuring leakage, test each individual joint for leakage.
2. Provide device specifically designed for testing of pipe joints and consisting of a metal cylinder, seal ring on each side of joint, and method of applying pressure to joint.
 - a. Manufacturer:
 - 1) Mechanical Research and Design, Inc., Manitowoc, WI.
 - 2) Cherne Industries, Inc., Minneapolis, MN.
3. Measurement Accuracy: Plus or minus 0.05 gallon(s) of water leakage under specified conditions.
4. Determine height of groundwater table at time of test.
5. Minimum Pressure, Each Joint: 2.5 psi above backpressure of groundwater.
6. Minimum Test Duration, Each Joint:
 - a. 20 minutes for 60-inch diameter pipe and smaller.
 - b. 10 minutes for pipe larger than 60-inch diameter.
7. Maximum Leakage Per Joint: 0.0008 gallon(s) per hour per inch-diameter times length of distance between pipe joints.

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D. Infiltration Test:

1. Where groundwater is 2 feet above top of a section of pipe, measure flow of water in pipe and rates of infiltration using a calibrated weir. Leave weir in line until flow rate has stabilized. Verify groundwater elevation.
 - a. Maximum Acceptable Total Infiltration of Groundwater as Determined by Test: 50 gallons per 24 hours per inch-mile of pipe.
 - b. Make infiltration tests on all sewer construction before placing lines in service and before making any connections to other sewers.
 - c. If amount of infiltration into sewer(s) is in excess of maximum quantity specified above, repair joints, relay sewer (if necessary), or perform other remedial construction as required.
 - d. Repeat test until each sewer meets specified infiltration amount.

E. Test Report Documentation:

1. Test date.
2. Pipe section or pipe joint tested.
3. Test method.
4. Test pressure.
5. Length of test.
6. Pressure or water loss.
7. Remarks, including:
 - a. Leaks (type, location).
 - b. Repair/replacement performed to remedy excessive leakage.
8. Signed by Contractor and Engineer to represent that test has been satisfactorily completed.

3.06 INSPECTION

A. Television Pipeline Inspection:

1. General:
 - a. Internally inspect sewer pipelines by closed circuit television (CCTV) after completion of pipeline cleaning and testing.
 - b. Conduct inspection in presence of Engineer.
2. Procedure:
 - a. Provide complete and continuous taped record and written log of inspection.
 - b. HD format.

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- c. Television Camera Equipment:
 - 1) Rotating lens or pan and tilt.
 - 2) Resolution: Minimum 460 lines per inch.
 - 3) Focal Distance: Adjustable through a range of 6 inches to infinity.
 - 4) Remote-Reading Footage Counter: Accurate to less than 1 percent error.
 - 5) Lighting: Sufficient to provide clear, in-focus picture of entire inside periphery of pipe, and minimizes reflection.
 - d. Pull camera at uniform rate, stopping to properly document defects. Maximum pull of camera shall not exceed 30 feet per minute.
3. Quality Standard:
- a. Provide clear, sharp image when played back on conventional television receiver.
 - b. Neatly label HD showing contents, project title, HD number, pipe structure identification numbers, date HD was made, and inspection company.
 - c. Tapes to Include:
 - 1) Opening Screen:
 - a) Date of inspection.
 - b) Pipe structure identification number.
 - c) Upstream and downstream node identification numbers.
 - d) Street address.
 - e) Pipe size.
 - f) Normal (upstream to downstream) or reverse (downstream to upstream) pull.
 - 2) Continuous View: Current distance along reach (tape counter footage).
 - d. Log sheets to show time and date of inspection, location, upstream and downstream manholes, direction of pull, pipeline length, pipe size, pipe material, location of lateral connections, video tape number and detail of defects encountered.
 - e. Show sufficient detail to determine cracks in pipe, offset joints, leaking joints, sags, and other flaws in pipeline installation. Record location of deficiencies by distance from center of reference manhole.
 - f. Upon completion, playback video in presence of Engineer. Any video not meeting quality standard will be rejected and videoing process repeated.
 - g. Correct deficiencies found as a result of video replay and repeat CCTV inspection.

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B. Manual Inspection:

1. Pipe 36 inches and larger.
2. Provide any specialized equipment required for inspection for Owner and Engineer.
3. Maintain voice communications between in-pipe and aboveground personnel at all times during in-pipe inspection.
4. Record inspection on VHS-formatted videotape and inspection logs. Provide digital, color, still photographs of defects or other features as requested by Engineer.
5. Log Sheets: Show time and date of inspection, location, upstream and downstream structure numbers, pipeline length, pipe size, pipe segment length, pipe material, lateral connections located by pipe segment number, and location and detail of defects encountered.

C. Deficiencies Requiring Correction:

1. Variations in alignment greater than specified herein.
2. Joint separations greater than allowed by pipe manufacturer.
3. Visible infiltration.
4. Presence of debris or foreign objects.
5. Obvious damage or defects in pipeline.
6. Sags, bellies, or negative slopes.
7. Slope less than minimum allowable

3.07 SUPPLEMENTS

A. Data Sheets.

Number	Title
-.01	Corrugated Metal
-.05	Reinforced Concrete

END OF SECTION

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SECTION 33 41 01.01 CORRUGATED METAL	
Item	Description
Pipe	AASHTO M36-03(2011), Full Circular Cross Section Type I, or AASHTO M196-92 (2012), Full Circular Cross Section Type I.
Coupling Bands	Manufacturer's standard, with same protective coating as pipe, if specified.
Gaskets	Manufacturer's standard.
Fittings	Constructed of the same material Specified in Section 33 41 01, Storm Drain Sanitary Sewer and Drainage Piping.
Source Quality Control	In accordance with specified reference standard.

END OF SECTION

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SECTION 33 41 01.05 REINFORCED CONCRETE	
Item	Description
Pipe	ASTM C76 Class III, Wall B or C. Mark each joint with pipe class in accordance with requirements of ASTM C76. Rotating packer or platform not allowed.
Cement	ASTM C150, Type II, or ASTM C150, Type I, with fly ash; maximum 12 percent Tricalcium Aluminate, or ASTM C595 Rev A, Type IP, with fly ash; Cement: ASTM C150. Minimum 564 pounds per cubic yard without fly ash. Minimum 479 pounds per cubic yard with fly ash.
Ratio: Water to Cementitious Materials	Not over 0.49.
Fly Ash	ASTM C618, Class C or Class F, Tables 1 and 2 modified as follows: Loss on Ignition: Maximum 3 percent Water Requirement: Maximum 100 percent of control Ratio Percent CaO/Fe ₂ O ₃ : Maximum 1.5 or test cement fly ash mix in accordance with ASTM C1012. Mix: Equal to or better than ASTM C150, Type II cement. 85 pounds per cubic yard minimum, 160 pounds per cubic yard maximum. Test: ASTM C311 and ASTM C618.
Joints	ASTM C443 Rev A. Captive gasket in groove.
Rubber Gaskets	ASTM C443. Lubricants as approved by manufacturer.
Circumferential Reinforcement	Not closer than 1 inch to inside surface of pipe. Area of outer circular reinforcing cage not less than 75 percent of inner cage.
Elliptical Reinforcement	Not allowed.

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SECTION 33 41 01.05 REINFORCED CONCRETE	
Item	Description
Source Quality Control Testing	<p>Load Bearing 0.01-inch Crack, Compressive Strength and Absorption: ASTM C76.</p> <p>Load Bearing Ultimate: ASTM C76.</p> <p>Permeability: ASTM C497.</p> <p>Voids: Longitudinally sawcut one pipe from each 100 lengths of pipe manufactured in half with saw that will not damage the concrete or reinforcing steel. Inspect for voids adjacent to circumferential bars. Voids will be considered continuous if a 1/16-inch diameter pin can be inserted 1/4 inch deep. If voids exist adjacent to more than 10 percent of the circumferential bars, two additional pipes shall be tested. If either of the two pipes fail, the entire 100 lengths will be rejected.</p>

END OF SECTION